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A major variable by which national educational systems may be compared is their structural differentiation, defined (1) as a process, referring to the multiplication of one structural element into two or more structurally distinct elements; and (2) as a state, referring to the number of structurally distinct elements which exist in a system at a particular point in time. Findings of the study, based on data for 1950 and 1960 from the 19 Latin American and 49 non-Western nations autonomous before 1960, generally supported two basic hypotheses: (1) The sequence of acquisition of structural elements in Latin American educational systems has tended to follow the item ranking of a Guttman scale of structural differentiation for that area, and (2) better than 50% accurate prediction of the structural elements an educational system will next acquire is possible when the system's differentiation level is known. Both alone and in conjunction with enrollment ratios, communicability, and urbanization, structural differentiation was found to be a key variable in educational system adaptiveness. Development of the scalogram is explained, supporting correlational data are tabulated, and bibliographies of source material are appended. (JK)

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A CROSS-NATIONAL STUDY OF EDUCATION AND DEVELOPMENT USING SCALOGRAM ANALYSIS

The Structural Differentiation of Developing Educational Systems

Joseph P. Farrell

Syracuse University

Syracuse, New York

September 1968

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Joseph P. Farrell
July, 1968

SUMMARY

It is the purpose of this work to develop a measure of educational structural differentiation and to use that measure to explore a variety of relationships and to test a few hypotheses concerning the role of education in national development.

As a process structural differentiation refers to the multiplication of one structural element into two or more structurally distinct elements. As a state it refers to the number of structurally distinct specialized elements which exist in a system at a particular point in time. This dimension is central to the social systems perspective adopted, in that it indexes the ability of a system to process information, and consequently indexes its ability to adapt to environmental changes.

Guttman scales of structural differentiation among the educational systems of the nineteen autonomous Latin American nations in 1960 and a set of forty-nine developing nations in 1960 are presented.

The first substantive problem to be considered is the extent to which structural differentiation in educational systems is an evolutionary process. Two hypotheses are advanced. 1) The sequence of acquisition of structural elements in educational systems in Latin America has tended to follow the item ranking on the scale of educational structural differentiation for that area. 2) Given knowledge of the level of differentiation of an educational system at a particular point in time, it is possible to predict with better than 50 percent accuracy the structural elements which the system will next acquire. The actual dates of acquisition of scale items were found for the Latin American systems. Although the data is far from complete, it does lend credence to the first hypothesis. In order to test the second hypothesis a scale of educational structural differentiation in Latin America in 1950 is presented, and compared with the 1960 Latin American scale. It is possible to predict item acquisition with better than 80 percent accuracy.

Cross-sectional correlations between variables within the boundaries of educational systems are next considered. Rank associations between structural differentiation, enrollment, and segmentation are given

particular attention. Segmentation refers to the number of any particular structural unit in a system at a given point in time. Two findings stand out. Structural differentiation is as highly associated with enrollment as is segmentation. The two structural dimensions--differentiation and segmentation--are more predictors of than predicted by enrollment.

Finally, relationships which cross educational system boundaries are examined. Within the system structural differentiation and enrollment ratios are considered. Two extra-educational dimensions--communicability and urbanization--are also considered. Communicability refers to the differentiation or information-processing capability of non-educational social systems. Urbanization is the term chosen to refer to whatever it is that is measured by such traditional "development" indicators as GNP per capita, commercial energy consumption, mass media distribution, etc., all of which have been repeatedly found to be highly interrelated.

It is hypothesized that 1) structural differentiation relates highly to communicability and less highly

to urbanization, and 2) enrollment ratios relate highly to urbanization and less highly to communicability. Structural differentiation is highly associated with communicability. However, it is almost as highly associated with urbanization. Enrollment ratios are weakly associated with communicability, but they are also not very highly associated with urbanization. Using evidence from both 1950 and 1960 a simple model of the associations between the four major dimensions over time is developed, and its adequacy is demonstrated by using multiple rank associations. Structural differentiation is found to play a strategic role in the adaptation of educational systems to a much wider range of environmental changes than had been anticipated.

CHAPTER I

INTRODUCTION

This study has proceeded from an assumption that increased understanding of the growth of educational systems, and of the role of education in the process of national development depends in large part upon (1) the isolation of single dimensions or variables, (2) the measurement of such variables, and (3) the use of the measures to assess relationships between the variables. It is the purpose of this work to develop a measure of a carefully defined and theoretically important variable, and to use that measure to explore a variety of relationships and to test a few hypotheses concerning the role of education in national development. The variable being considered is structural differentiation of educational systems; the measure is a cumulative, Guttman, scale.

In Chapter I three tasks will be undertaken. First, a frame of reference which has guided much of the author's thinking will be briefly described. Second, the central variable in the study, structural differentiation, will be defined. Finally, attention will be given to the centrality of structural differentiation in the frame of reference.

A General Frame of Reference

The conceptual frame of reference guiding much of this work is a social systems model, of the type which had lately gained considerable popularity. Since the terms "social system" and "systems analysis" have a variety of referents, it should be made clear which of the many possible meanings is being adopted here. The details of this model have been given exhaustive treatment elsewhere.[1] The following discussion focusses upon those points which are particularly salient for this study.

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[1] See, for example, Walter Buckley, Sociology and Modern Systems Analysis (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1967); David Easton, A Framework for Political Analysis (Englewood Cliffs, N.J.: Prentice Hall Inc., 1965); David Easton, A Systems Analysis of Political Life (New York: John Wiley and Sons, Inc., 1965); and Bertram Gross, "The State of the Nation: Social Systems Accounting," Social Indicators, ed., Raymond A. Bauer (Cambridge, Mass.: The M. I. T. Press, 1966).

First, a social system is a set up of inter-relationships. It is not a natural system, a group of human beings selected out for investigation, but one among many sets of interactions in which human beings may be engaged. Thus, an educational system will be taken to refer not to an isolable group of people, but to an isolable set of interactions. Easton has put the matter this way: "to analyze any one set of interactions it will be mandatory to abstract them from the whole matrix of behavior within which they occur. . . .All social systems must be interpreted as being analytic in character."[1] Because social systems are analytic rather than natural entities the types of interactions to be included and excluded, that is, the location of boundaries, is a matter for somewhat arbitrary decision, depending principally upon the purposes of the investigator.[2]

System structure refers to the units between which the interactions occur. The structural units can be considered as interactive nodes or foci, the most elemental of which are roles. In any relatively complex system, however, roles are organized into a variety of subsystems. Such subsystems, subsuming a variety of roles united in relatively stable interactive patterns, can themselves be considered the structural units of large complex systems.[1] National-level educational systems are the focus of concern here. The relevant structural units will be taken to include formal schools of various types and levels, departments and agencies of the ministry(ies) directly concerned with formal education, and university faculties and agencies.

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[1] Easton, A Framework for Political Analysis, p. 37.

[2] This decision also depends upon the demonstrable utility of any particular boundary setting. But this is a judgement which can only be made post hoc, and consequently is not of direct concern here. For thorough discussions of this point, see Easton, A Framework for Political Analysis, pp. 30-32, and Buckley, p. 41.

Second, a social system is considered to be an organized set of elements. The nature of a given system is due not merely to the characteristics of its constituent parts, but to the particular organizational pattern which has developed. Buckley notes:

> When we say that the 'whole is more than the sum of its parts,'. . .the 'more than' points to the fact of organization, which imparts to the aggregate characters that are not only different from, but often not found in the components alone; and the 'sum of the parts' must be taken to mean, not their numerical addition, but their unorganized aggregation.[2]

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[1] As with the problem of setting system boundaries, the choice of structural units is to some extent a matter of individual choice, with the ultimate test being utility.

[2] Buckley, p. 42.

It is assumed: (1) any given set of elements may be organized in a variety of ways, and (2) such differences in organization may have important consequences for the performance of a system. For example, educational systems having identical types of vocational and university preparatory secondary schools, and university faculties, can differ considerably in the ways in which these are organized. In one system, vocational secondary schools may be linked with certain university faculties; in another, only university preparatory secondary schools may be linked with the university, and so forth. Given identical inputs, such systems would be expected to produce at least somewhat different outputs.

Third, a social system is open. It is capable of engaging in a variety of transactions with its environment. Such boundary crossing interactions are usually referred to as input and output relations. Moreover, such a system is capable of adapting to changes in its environment, including those resulting from the short- or long-term impact of its own output on the environment (commonly called feedback). Such a self-regulating, self-directing, self-organizing system, which has the potential to maintain its viability despite substantial environmental changes, is referred to as cybernetic. An adaptive social system differs crucially from the closed entropic systems common to the physical world, whose typical response to substantial environmental change is loss of organization or change in direction of dissolution. Because of its ability to structure its environmental transactions a social system is negentropic.

Fourth, the relations between the elements of the system, and between the system and its environment, involve not energy exchange, as is characteristic of natural or mechanical systems, but "complex communication processes of information exchange."[1] Information is here construed much differently than is typical in studies of communication and national development. Such studies generally argue on an empirical basis for the importance of mass media development in the process of national development.[2] Information is taken to mean that which is communicated directly, person-to-person, through the verbal or "silent" language, or indirectly, via the mass media. Information in the present work is considered more broadly, to include not only gestures and words, but types of organization, social institutions, social roles, technology, material, and so forth. As Colin Cherry has noted:

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[1] Buckley, p. 43, emphasis added.

[2] For example, Ithiel De Sola Pool, "The Role of Communication in the Process of Modernization and Technological Change," Industrialization and Society, eds., Bert F. Hozelity and Wilbert E. Moore (Paris: UNESCO-Mouton, 1963); and Daniel Lerner, The Passing of Traditional Society (New York: The Free Press, 1958).

> Speech and writing are by no means our only systems of communication. . . . [in addition to gestures, expressions, position, etc., which make up the silent language] we have economic systems for traffiking not in ideas but in material goods and services; the tokens of communication are coins, bonds, letters or credit, and so on. We have conventions of dress, rules of the road, social formalities, and good manners; we have rules of membership and function in business institutions, and families. . . .A 'code' of ethics. . . . is a set of guiding rules governing 'ought' situations, generally accepted, whereby people in a society associate together and have social coherence.[1]

Culture is viewed as a system of shared meanings attached to social objects, developed from the interlocking contributions of the many individuals in a society. It is a "complex symbolic structure by which members of the system manipulate incoming and outgoing information."[1] A social system is then a system for the orderly processing of such information.

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[1] Colin Cherry, On Human Communication ("Science Editions," New York: John Wiley and Sons, Inc., 1961), pp. 4 and 8.

MacKay's work gives added texture to this approach to information.[2] A system is considered to have a repertoire of basic acts, which in various combinations and sequences constitute its behavior. In order for its behavior to be adaptive, the system must organize these acts according to the state of the environment in relation to the system.

> In its most basic terms we may regard what is required as equivalent to a vast constantly changing matrix of conditional probabilities. . .determining the relative probabilities of various patterns (and patterns of patterns) of behavior in all possible circumstances.[3]

Whenever the available array of patterns in the system does not match the environmental state of affairs--and every environmental change will put them slightly out of phase--"logical work" must be done to update the array.

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[1] Frank Young, Berkely Spencer, and Jan Flora, "Social Differentiation and Solidarity in Peasant Communities," Cornell University, n.d. (Mimeographed), p. 4.

[2] Donald M. MacKay, "The Informational Analysis of Questions and Commands," Information Theory: Fourth London Symposium (London: Butterworth and Company, Publisher, Ltd., 1961), cited in Buckley, pp. 48-50. MacKay is speaking specifically of biological organisms. However, his discussion is sufficiently formal to be readily applicable to social systems.

[3] Ibid., p. 48.

> This 'logical work' consists in the adjusting and moulding of the conditional probability structure of the organizing system: the formation, strengthening, or dissolution of functional linkages between various basic acts or basic sequences of acts. The total configuration of these linkages embodies what we may call the total 'state of readiness' of the organism.[1]

Information is defined as that which does such logical work on the conditional probability matrix, or orientation, of the system.

A social system is distinguished from an organism, or from closed mechanical systems, primarily by the availability of a much larger repertoire of possible responses to environmental change. A social system, then, is a complexly organized information-processing set of elements, which is adaptive and negentropic because it is capable of mapping into itself information relative to a very wide range of environmental changes.

The Meaning of Structural Differentiation

Differentiation is a general concept with a wide variety of applications. One may speak of role differentiation, of rank or status differentiation, of the differentiation of formal organizations, in biological terms of the differentiation of organisms, and so forth. Here the term structural differentiation is used, to denote that this general concept is being applied to the structural elements of a social system. Structural differentiation can be thought of as both a process and a state. As a process, it refers to the multiplication of one structural element into two or more structurally distinct elements. As Smelser has noted, the term refers to "the establishment of more specialized and more autonomous social units."[1] As a state, structural differentiation refers to the number of structurally distinct specialized elements which exist in a system at a particular point in time.

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[1] *Ibid*., p. 49.

The meaning of the term structural differentiation can be made more precise by distinguishing it from some related terms with which it may be confused.

Structural differentiation does not refer to segmentation, the ramification or proliferation of a given type of element, e.g., increase in the number of

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[1] Neil J. Smelser, "Mechanisms of Change and Adjustment to Change," Political Development and Social Change, ed. Jason L. Finkle and Richard W. Gable (New York: John Wiley and Sons, 1966), p. 29. It should be noted that the term "elaboration" is sometimes used to refer to the creation of entirely new structural elements to perform entirely new tasks. This meaning will be included within the referents of the term structural differentiation in this work. There is some question as to whether there is ever an entirely new structural element or task in a social system.

secondary commercial schools. One can think of differentiation as an answer to the question--How many different types of structural elements exist in a system?--and of segmentation as an answer to the question--How many of a given type of element exist in a system? Similarly, differentiation does not refer to the transfer of function from one to another _existing_ structural element, as in the transfer of sex education responsibility from the family or church to the school. This would involve differentiation only if a new type of element, say a sex education school, were created. Finally, differentiation does not refer to changes in organizational patterns. Again, differentiation would be involved in such changes only if a new type of structural element were created as part of the organizational change.

The Significance of Structural Differentiation

To speak to the "significance" of the central variable in a study is essentially to deal with the question: Why bother? In the present case, this separates into two questions: (1) Why the concern with differentiation? and (2) Why the concern with structural differentiation? The latter will be considered first.

The Significance of Structure

Bertram Gross has noted that "any well rounded view of a social system must deal with both structure and performance."[1] It has long been recognized that concentration on structure without consideration of performance can lead, within any particular society, to a static view of reality, and in cross-national work to what Riggs has noted as the "trap of ethnocentric institutionalism.[2] That is, ignoring performance can blind one to the facts that similar structures can perform differently in different settings, and that similar tasks can be performed by a variety of structures.

On the other hand, it is extremely difficult to talk about performance or activity, without reference to what it is that is performing. David Easton, for example, in his analyses of political systems, states at the outset his intention to consider only input and output relations, and to avoid direct concern with political structures. However, as Gross points out, "it proves impossible [for Easton] to escape dealing with the question, [sic] 'input into what?' and 'output from what?'"[1]

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[1] Gross, p. 181. The term performance is used rather than function to avoid the confusion of meanings attached to the latter term. Merton has claimed that "social function refers to observable objective consequences." Robert K. Merton, On Theoretical Sociology (New York: The Free Press, 1967), p. 78. To speak of the consequences of a system is to speak of what it does, of what its performance is.

[2] Fred Riggs, "The Comparison of Whole Political Systems," (C.A.G Occasional Paper, 1967), p. 1.

But to deal with structure and performance, as related but not identical variables, requires independent measures of relevant dimensions of each. However, whether used for the scholarly study of school-society relationships or for phrasing planning objectives, the measures currently available for cross-cultural analysis of educational systems are invariably indicators of system performance or output and system input.

Literacy rates are the most commonly found educational indicator. Literacy is, of course, only indirectly the result of schooling and its retention in a population depends upon many factors which vary from nation to nation and are extraneous to schooling.

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[1] Gross, p. 180.

Nonetheless, such rates are clearly used to give a rough estimate of the performance of a school system.

Another quite common indicator, which is a more direct measure of output, is graduates by level of schooling. As typically used, this is really a measure of the receptacles in which the output comes, since it is seldom disaggregated according to type or level of actual or potential behavior acquired. Thus what one usually has is not a measure of what schooling has added to students' capabilities, but rather a count of the number to which something has presumably been added. This difficulty is only slightly remedied by the crude differentiations which are occasionally found, for example between university preparatory and vocational secondary schooling, or between university faculties.

Enrollment figures are the third frequently encountered educational measure. Although in one sense measures of system input, in that they refer to the number of clients in the system, enrollment data are ordinarily used as surrogates for more direct measures of performance. That is, if adequate data on the number of graduates from various levels and types of schooling, or the types of skills and knowledge they have acquired, cannot be obtained, enrollment data at least place an upper limit on potential output. Moreover, if taken as a ratio to the total eligible population, they provide a rough index of how well the system is doing.

The only other data series which have been used to any extent to measure educational systems are both input measures. The first is number of teachers in the system, usually considered by level, and occasionally by years of training received. The other is government investment in education, either per pupil, as a proportion of total government expenditures, or as a proportion of Gross National Product.

Two rather more complex measures of educational output have recently been developed by Donald Sanders and Kenneth Neff. Both combine graduates and enrollment data with curricular information to get some idea of the potential behavior acquired by students passing through various channels within the system. Sanders' technique measures performance in terms of "pupil-hours"--the actual hours of exposure to various categories of content provided in any given year and over a period of years. Neff has developed what is essentially an efficiency measure, relating input, in terms of man-years invested in the system, to output, measured in terms of potential man-years of utility to the society of graduates and school-leavers.[1]

Perhaps the most extensive current attempt at systematic cross-national data gathering is the Unesco supported effort to develop cross-culturally valid achievement tests. The first results, in mathematics, indicate that a variety of cross-nationally comparable achievement test results may eventually be available.[2] Any measures using these results will, by definition, be measures of performance. Thus, even the most sophisticated efforts at educational measurement to date concentrate on performance.

Therefore, the attempt in this work to develop a measure of one dimension of system structure strikes out in a new direction. This is not to say that structure has been completely ignored in comparative education, or in studies of education generally. Indeed, a large share of the published literature in comparative education consists of descriptions of individual national systems, or parts thereof. Such studies typically describe in some detail the major structural elements, and the organizational characteristics. Histories of education are frequently concerned with the development of educational structures, with the "rise of the university" or the expansion of elementary education, for example. But such considerations of structure, being in the nature of ideosyncratic case studies, dealing with single societies, or with a few societies considered separately, have, by definition, not developed measures[1] of structure; that is, they have not attempted to develop some sort of scale upon which different systems can be ordered. What is new here is the suggestion that at least one dimension of structure, differentiation, can be measured, and that such a measure can be used for the comparative analysis of a sample of societies sufficiently wide as to permit valid generalization and specification.[2]

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[1] For detailed descriptions of these two measurement techniques and a discussion of their relative merits and drawbacks, see Don Adams and Joseph P. Farrell (eds.), Education and Social Development (Syracuse, N.Y.: Syracuse University, Center for Development Education, 1966), Chapters 10-11.

[2] Torsten Husein (ed.), International Study of Achievement in Mathematics (New York: John Wiley and Sons, Inc., 1967).

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[1] National educational systems are the units of analysis in this study. Consequently, wherever the term "measure" is used it refers to cross-national measure.

[2] It is assumed here that the primary purpose of comparative studies is the generalization and specification of propositions--statements of relation between variables. The difference between the two processes is well marked by Marsh: "Where replication and generalization demonstrate that societies of similar or different

The Significance of Differentiation

Among the several theoretically isolable dimensions of system structure, differentiation appears to be particularly strategic, for several reasons. In the first place, differentiation has a certain logical priority. That is, one cannot very well talk about segmentation or function transfer without at least implicitely referring to the basic array of available elements. Similarly, one can hardly give attention to patterns of organization without considering the set of elements being organized.

Of much greater importance, however, is the place the variable differentiation occupies in social systems theory. It has been noted by several scholars working within the general rubric of systems analysis that differentiation is crucial to an understanding of changes in social systems for one or both of two reasons: 1) it is a, if not the, principal process through which social systems adapt to changes in their environments;

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types all exhibit the patterns or relationships stated in the original proposition, specification seeks to reformulate the original proposition in such a way that comparative variations between societies or sub-systems thereof are incorporated into the propositions as control factors or intervening variables." (Robert Marsh, "The Bearing of Comparative Analysis on Sociological Theory," Social Forces, XLIII [December, 1964], 196).

and 2) the level of differentiation at any point in time is a good index of the ability of a system further to adapt.

Walter Buckley, whose work has been one of the major sources of the systems viewpoint outlined in this chapter, has claimed that the typical way in which a social system maps into itself environmental change is elaboration or change of its structure "to a higher or more complex level."[1]

David Easton has likewise pointed to structural differentiation as one of the key adaptive mechanisms in social systems.

> What political systems as a type of social system possess uniquely, when compared to both biological and mechanical systems, is the capacity to transform themselves, their goals, practices, and the very structures of their internal organization. To keep the vital processes, the essential variables, of a political system alive, as it were, a system may remodel its structures and processes to the point where they are unrecognizable. . . . Typically, most systems under overload conditions have responded by increasing their channel capacity for bearing demands to the point where they become outputs. . . .The very proliferation of political structures has meant that there are many more means through which demand can be processed. The fact that increasing structural

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[1] Buckley, p. 50.

> differentiation has been accompanied by added specialization has also meant that those channels may remain open for what amounts to longer periods of time; they can thus handle a greater volume.[1]

Perhaps the most extensive empirical consideration of differentiation is found in the work of Frank and Ruth Young and their associates. Starting with a series of empirical studies of the structural differentiation of small communities in Mexico and other developing nations[2] they later drew upon information theory as an explanatory conceptual framework,[3] and Ruth Young has recently completed an extensive application of the concepts and methods developed in these studies to the differentiation of national level social systems.[4] Differentiation is defined by the Youngs' as the capacity of a system to process diverse types of information. That is, the more diversified and specialized are the institutions of a society, the more information they can handle. Differentiation, then, is not merely a means by which social systems adapt to environmental change, but it is also a good predictor of the ability of a system to change further.[1]

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[1] Easton, A Framework for Political Analysis, pp. 99 and 123 (emphasis added); cf. also, Easton, A Systems Analysis of Political Life, p. 249.

[2] Frank W. Young and Ruth C. Young, "Social Integration and Change in Twenty-four Mexican Villages," Economic Development and Cultural Change, VIII, Part I (July, 1960); Young and Young, "The Sequence and Direction of Community Growth: A Cross-Cultural Generalization," Rural Sociology, XXVII (December, 1960); and Frank W. Young and Isao Fujimoto, "Social Differentiation in Latin American Communities," Economic Development and Cultural Change, XIII (August, 1965).

[3] Young, Spencer, and Flora.

[4] Ruth C. Young, "Some Dimensions of Development: A Cross-National Study," (unpublished MS, Department of Rural Sociology, Cornell University, 1966). Portions of this MS will be published in a forthcoming issue of the Journal of the Developing Areas.

Adding weight to the argument just made is the fact that differentiation has been found to play a similar key role in societal adaptation by a number of scholars utilizing theoretical perspectives other than systems analysis. Talcott Parsons, for example, in his most recent attacks on the problems of social change and social evolution, has claimed that the first step in processes of change which enhance adaptive capacity of a social system is differentiation.[2] Robert Marsh, who has used differentiation as the key organizing concept in his recent work, Comparative Sociology, has noted that it is the principal way in which societies adapt to changing functional requirements.[1] Alvin Boskoff, in an unpublished analysis of education and social change has stated: "I shall begin with the theoretically relevant nucleus of virtually all problems in modernization and development: the desire for new (and greater) levels of social complexity and specialization."[2] James Coleman, in the introduction to his edited volume on political development and education, has referred to differentiation as "the dominant empirical trend in the historic evolution of human society."[3] Finally, with reference specifically to educational systems, S. N. Eisenstadt has noted that one of the two major responses of such systems to the "pressures" of modernization has been a

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[1] See particularly Young and Young, Economic Development and Cultural Change, VIII. The Youngs' work is central to the discussion at several points in the following chapters and will be considered in much greater detail where germane.

[2] Talcott Parsons, Societies: Evolutionary and Comparative Perspectives (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1966), p. 22; c.f., Talcott Parsons, "Some Considerations on the Theory of Social Change," Rural Sociology, XXVI (September, 1961).

> . . .growing specialization of roles and organizations. . .a continuous differentiation between the different levels of the educational system--between primary, secondary, vocational, adult, and higher education. . . . Each of these 'systems' and even many subsystems of each, has gradually become more autonomous, specialized, and organized in its own framework.[4]

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[1] Robert Marsh, Comparative Sociology (New York: Harcourt, Brace, and World, 1967), p. 38.

[2] Alvin Boskoff, "Social Consequences of Educational Change: The Problem of Translating Theory into Meaningful Measurement," (unpublished paper, Center for Development Education, Syracuse University, 1965), p. 2.

[3] James Coleman (ed.), Education and Political Development (Princeton: Princeton University Press, 1965), p. 15.

[4] S. N. Eisenstadt, Modernization: Protest and Change (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1966), pp. 18-19.

Thus, an empirical study of structural differentiation will have relevance not only to the systems analysis frame of reference, but to a variety of other theoretical perspectives as well.

CHAPTER II

METHODOLOGY: GENERAL STRATEGY AND SPECIFIC TECHNIQUES

The Measurement of Structural Differentiation

Concern in this study is to measure the extent or level of structural differentiation in a variety of national educational systems. Given the definition of structural differentiation as a state it would seem at first glance that the best and simplest measure would be a count of the number of types of separate structural elements within each system.[1] Such an approach to measurement runs into two difficulties.

The problems encountered by Naroll in his attempt to develop just such a measure for very simple societies (he wished to get a simple count of craft-specialties) illustrate the first difficulty--this would be a nearly impossible task in any contemporary national system.[2] The number of possible structural elements is simply too great. This is particularly a problem in the study of developing nations, for there is no way of telling if the extant descriptions of their educational systems are complete, or close to complete. What is needed, then, is a measurement technique which permits the use of a sample of possible elements which can be tested against each national system.

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[1] Indeed, Marsh claims that such a count is the "ideal indicator of differentiation." Comparative Sociology, p. 33.

[2] Raoul Naroll, "A Preliminary Index of Social Development," American Anthropologist, LVIII, No. 4 (1956).

The second problem is more fundamental. There is no prima facie reason for assuming that all types of educational structural elements should be included in the same count. Does, for example, having six different types of higher educational elements and three types of secondary educational elements represent as much differentiation or the same kind of differentiation as having six types of secondary educational elements and three types of higher educational elements? Perhaps it does, but the point needs demonstration, not assumption. It may be that there is not a single dimension, educational structural differentiation, under which elements from all parts of a national educational system can be subsumed, but a variety of dimensions--higher educational differentiation, secondary educational differentiation, ministerial level differentiation, etc.--which are closely related but not identical. A simple count, even if possible, would thus produce an equivocal measure. One could not be sure that two systems with equal scores were in the same sense equally differentiated structurally. What is needed then is a measurement technique which not only permits the use of a sample of elements, but which assures unidimensionality--which assures, that is, that the items included can appropriately be counted together, that one, and only one, variable is being measured. Guttman scalogram analysis, the technique used in this study, meets these criteria.

Scalogram analysis, originally devised for the measurement of attitudes, has been the measurement technique most commonly employed in previous empirical studies of differentiation. The Youngs have used the technique in all their studies of differentiation, noted above.[1] Cutright has used scalogram analysis to measure the differentiation of national social security programs.[2] Winch and Freeman have presented a Guttman scale of the complexity of small primitive societies.[1] Before describing this measurement technique, two other indices which purport to measure differentiation will be considered.

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[1] See footnote 2, p. 20, Chapter I.

[2] Phillips Cutright, "Political Structure, Economic Development and National Social Security Programs," American Journal of Sociology, LXX, No. 2 (March, 1965).

In 1963 Cutright reported an index of political development based on the assumption that "a politically developed nation has more complex and specialized national political institutions than a less politically developed one."[2] On this index high scores were given to nations having 1) elected legislatures containing representatives of two or more parties, in which minority party representation accounted for at least 30 percent of the seats, and 2) a chief executive either elected in an open competitive contest or selected by a legislature qualifying for the highest score as noted in 1). Lowest scores were given to nations having hereditary rulers and no parliaments. Nations were scored for each of the twenty-one years from 1940 to 1960 and scores were cumulated to get a total score. Unfortunately, this index measures not specialization or differentiation but the ability of a society to maintain over a number of years "Western" competitive political institutions.

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[1] Robert Winch and Linton Freeman, "Societal Complexity: An Empirical Test of a Typology of Societies," American Journal of Sociology, LXII, No. 5 (March, 1957).

[2] Phillips Cutright, "National Political Development: Measurement and Analysis," American Sociological Review XXVIII, No. 2 (1963), 255.

Marsh recently constructed two indices of differentiation and used them to rank 467 "primitive" and 114 contemporary national societies.[1] For primitive societies Marsh assigned a score of zero to four for population size, and zero to three for degree of stratification, and added, in both cases using classifications from Murdock's World Ethnographic Sample. Contemporary national societies were scored by adding standardized T scores of 1) percentage of males in non-agricultural occupations, and 2) gross energy consumption in megawatt hours per capita for one year. Clearly, none of these four variables is a direct measure of differentiation. Each is a surrogate chosen because of a presumed high correlation with differentiation.

Two problems arise, however. Where some of these surrogates have been correlated with a more direct measure of differentiation, one of the scales developed by Young, the relationships have been found to be far from perfect, and, most importantly, to vary considerably from one geocultural region to another.[1] To the extent that these correlations are not perfect and not stable from region to region, the rankings will be inaccurate. Moreover, these indices suffer from a problem common to measures which combine data series. For each index, the two components are given equal weight. But there is no reason to assume that each contributes equally, or is related equally well, to differentiation. Thus, the validity of the rankings provided by Marsh's indices remains an open question.

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[1] Marsh, Comparative Sociology, pp. 35-36 and Appendix A.

Detailed discussions can be found elsewhere of the theoretical and procedural aspects of scalogram analysis. Thus, only a brief general description of the technique is offered here.[2] The data needed for scalogram analysis of social objects are a sample of societies and a set of items or traits dichotomized into presence-absence categories.[1] A matrix of the variables is formed and the data rearranged until a pattern is evident. If the pattern meets certain formal requirements, a scale is said to have been found. It should not be concluded, however, that the emergence of a scale can be artifact of the manipulation. A scale pattern is either inherent within the data or it is not. The rearrangement of data merely makes it manifest. A manufactured example can illustrate this.

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[1] This measure, a scale of "national communicability" can be found in Appendix A. It will be discussed in more detail in the following chapters. Young's scale correlates with commercial energy consumption per capita as follows: for nineteen autonomous Latin American nations, .45; for seventeen autonomous Moslem nations, .29. For the statistic used, Kendall's Tau, the Latin American coefficient is fairly high and statistically significant, but it is far from perfect, and the regional disparity is quite clear. A similar pattern is found when Young's scale is related to indices roughly equivalent to Marsh's "percent of males in non-agricultural occupations."

[2] Many of the intricate technical refinements of scalogram analysis developed for its application to individual characteristics, such as attitudes, are not

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relevant to its application to social system characteristics. The following are among the most useful technical discussions for the present purpose: Allen Edwards, *Techniques of Attitude Scale Construction* (New York: Appleton Century Crofts, 1957); Leo Goodman, "Simple Statistical Methods for Scalogram Analysis," *Psychometrika*, XXIV (March, 1959); Herbert Menzel, "A New Coefficient for Scalogram Analysis," *Public Opinion Quarterly*, XVII (September, 1953); Warren Torgerson, *Theory and Methods of Scaling* (New York: John Wiley and Sons, Inc., 1958); Matilda White Riley, *et al.*, *Sociological Studies in Scale Analysis* (New Brunswick, N.J.: Rutgers University Press, 1954); and Frank W. Young, *Initiation Ceremonies* (New York: Bobbs-Merrill Company, Inc., 1965), particularly Chapter 3.

[1] More complex categorizations than dichotomies can be used, and in attitude studies are typical. However, previous social object scales have used only the presence-absence dichotomization. The mechanical and analytical complications introduced when polychotomous items are used are not generally warranted by the results when measuring social objects. (Professor Linton Freeman, University of Pittsburg, personal communication, 1966). Moreover, it is not clear to what substantive condition(s) beyond presence and absence additional categories might refer.

In Table 1 are noted the presence (x) or absence (0) of 14 traits or elements (1. . . .14) for 10 societies (A. . . .J). No particular pattern is evident in the array. If, however, the data are rearranged such that the traits appear in order of decreasing frequency from left to right and the societies in increasing order from top to bottom according to number of traits present, Table 2 is produced. Here there is a definite pattern, in fact, a perfect scale.[1] What one is searching for are "scale types"

Table 1

Illustrative Scale Matrix--Unarranged

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	X	O	O	O	O	O	O	O	O	O	O	O	O	O
B	X	O	O	X	O	O	O	O	X	X	O	O	O	O
C	X	X	O	X	O	O	O	O	X	X	O	O	O	O
D	X	X	X	X	O	O	O	O	X	X	X	X	O	X
E	X	X	X	X	O	X	X	X	X	X	X	X	X	X
F	X	X	X	X	O	O	X	X	X	X	X	X	X	X
G	X	X	X	X	O	O	X	O	X	X	X	X	O	X
H	X	O	O	O	O	O	O	O	X	O	O	O	O	O
I	X	X	O	X	O	O	O	O	X	X	O	X	O	O
J	X	X	X	X	O	O	O	O	X	X	X	X	O	O

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[1] The rearrangement process is seldom this simple. Several attempts are frequently necessary, and with large amounts of data the procedure can be both tedious and cumbersome. Various mechanical aids, including electronic computers, can be used, however, with large masses of data. It is of course unimportant whether societies or traits are assigned to rows or columns, or whether order increases or decreases from left to right or top to bottom.

Table 2

Illustrative Scale Matrix--Rearranged

	1	9	4	10	2	12	3	11	14	7	8	13	6	5
A	X	O	O	O	O	O	O	O	O	O	O	O	O	O
H	X	X	O	O	O	O	O	O	O	O	O	O	O	O
B	X	X	X	X	O	O	O	O	O	O	O	O	O	O
C	X	X	X	X	X	O	O	O	O	O	O	O	O	O
I	X	X	X	X	X	X	O	O	O	O	O	O	O	O
J	X	X	X	X	X	X	X	X	O	O	O	O	O	O
D	X	X	X	X	X	X	X	X	X	O	O	O	O	O
G	X	X	X	X	X	X	X	X	X	X	O	O	O	O
F	X	X	X	X	X	X	X	X	X	X	X	X	O	O
E	X	X	X	X	X	X	X	X	X	X	X	X	X	O

in the response patterns of societies. A scale type response pattern is one in which there are uninterrupted series of Xs and Os. Thus (X X X O O O) would be a scale type response pattern, while (X X O X O O) would be a non-scale type response pattern, with one error. Thus, in Table 2 there is a perfect scale because the response pattern for each society is a scale type.

Such a scale has a number of formal properties, of which the following are most relevant; 1) Societies with higher rank on the scale have all the traits of societies with lower rank, and some in addition; 2) Knowledge of the presence or absence of any one trait in a society indicates the presence or absence of others as well; 3) If the items are numbered, and the number of the highest ranking item for a particular society is known, the complete inventory of items for that society can be identified; 4) If a set of items can be shown to scale, then one knows that one has a unidimensional measure; that is, one knows that the set of items, taken together, measures one and only one variable.[1]

For illustrative purposes a perfect scale has been presented. Reality, however, is seldom so neat and orderly as to allow the discovery of a perfect scale. Some error is almost always present. Such error should generally be taken as presenting a substantive problem, as indicating that some systems do not in every respect fit the standard pattern. However, scale error can also be the result of coding mistakes. In a study such as this it is very difficult to completely eliminate such mistakes. For one thing, one can never be entirely sure that the definitions and coding rules used are adequate. Furthermore, the reporting of social data, particularly for the developing world, is notoriously haphazard--even if one only wishes to determine if certain large and observable entities are present. There is, particularly, a danger that some nations may, for reasons of international or domestic political prestige, over-report--claiming that certain types of schools or agencies exist when in fact they do not.[1]

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[1] Unidimensionality is a sometimes confusing concept, particularly in the context of social object scaling, where it has a slightly different meaning than in attitude scaling. Briefly, in using this technique to study attitudes, if a set of responses scale, it is concluded that each response reflects the same underlying attitude, and only that attitude. In social object scaling, to say that a scale is a unidimensional measure is to say that, taken together, the entire set of items on the scale has enough content in common to be thought of as measuring a single variable. This distinction may be difficult to grasp without an example. Hence, it will be considered more fully after some of the scales developed for this study have been presented.

To minimize the incidence of coding mistakes, several procedures have been followed. First, for any item to be coded as present in a given system, there has had to be evidence not only that it is a separate, named, structural entity, but that there are either people in the structural entity or a budgetary allocation for it. This practice has minimized the likelihood of coding as present items which exist only on paper. An absence coding means that no evidence has been found which indicates that these criteria are satisfied. What this practice does is to specify the most likely locus of coding error. A decrease in the likelihood of coding as present items which do not in fact exist has been bought by increasing the risk of coding as absent items which do in fact exist.

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[1] This is particularly a problem when quantitative data gathered by such international agencies as Unesco and OAS are used, but even with the sort of data used here it may be a difficulty. It must also be recognized that nations may sometimes find it expedient to under-report. This is perhaps particularly a danger with new political regimes, which may wish to denigrate the achievements of their predecessors and/or make their own future accomplishments look more impressive. However, it is thought that over-reporting is the greater problem.

Some time after the original coding decisions were made, the author rechecked all the codings. In the course of this exercise several errors were uncovered in the original codings. Beyond this, all of the Latin American codings have been independently reviewed by another individual and many have been independently coded by still another worker. All of the Asian codings have similarly been independently coded. In the course of resolving disagreements among these independent codings a few more errors were uncovered.

It might be thought that a system's position on a scale of educational structural differentiation might depend rather heavily upon the amount of information available concerning that system. This is not the case. The rank association between number of country-specific sources consulted in this exercise (e.g., special reports by individual scholars or intergovernmental agencies, educational plans, annual reports of education ministries, etc.[1]) and amount of differentiation as measured by the scale reported in the following chapter is .19. This is quite low, particularly considering that the amount of available information concerning a nation is generally regarded as a correlate of its development.

Consequently, it is thought that the number of coding errors among the scales developed for this study is minimal, and that such errors as do exist are found among the absence codings. One final point, to put this discussion in its proper perspective--as a measurement technique, scalogram analysis is quite robust to coding error.

Assuming, then, that "error" will generally refer to a substantive problem, to an item actually present where it "ought not" to be (according to the scale), or actually absent where it "ought" to be present, there is the question of how much error is too much error.

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[1] The list of all sources consulted for constructing the scales used in this study is found in Appendix B.

At what point does one say that the error is too great, that a scale does not obtain in a given set of data?

The conventional answer to the last question has been to use the Coefficient of Reproducibility as originally devised by Guttman. This is simply the number of "correct" or non-error responses as a proportion of the total responses. If the CR is above 0.90 it is generally agreed that a scale is present. The Coefficient of Reproducibility can, however, give spuriously high results if there are many items which have high marginal totals (more than 80 percent of the responses in the modal category).[1] Since such items occur frequently in social object scaling it is wise to use the Coefficient of Scalability devised by Menzel, which corrects for this difficulty. The formula for this coefficient is:

$$\text{Coefficient of Scalability} = 1 - \frac{\text{Errors}}{\text{Smallest Number of non-modals}}$$

To obtain the denominator one sums the non-modal responses over columns and rows (in Tables 1 or 2 these numbers would be 34 and 36) and uses the smaller of the two. The generally accepted minimum for this coefficient is 0.65. Another somewhat simpler way around this difficulty, suggested by Ruth Young,[1] is to compute the CR using only items which have fewer than 80 percent of the responses in their modal category.

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[1] There are several other criteria which must be met to assure that CR is not spuriously high: 1) For dichotomous responses at least 10 items should be used; 2) The pattern of errors should be random, that is there should not be a number of subjects with the same non-scale pattern of responses; 3) Each item should have more non-error than error responses.

Perhaps the most difficult, and at the same time most important, single step in scalogram analysis is choosing the items or traits to test. This selection is often regarded as more nearly an art than a science. In most general terms, one starts with a concept and selects items which ought, on the basis of judgment and/or experience, to measure it--to form a scale. As Guttman has noted, the careful selection of candidate items in relation to a well-defined concept is crucial, because items "may happen to scale with an area and yet not have the content defining the area. . .(they) may be a correlate."[2] In developing the scales of educational structural differentiation for this study, it was found that a few items from a scale of economic institutional flexibility fitted in with one of the educational scales.[1] This does not mean that an item from the economic area--e.g. "membership in either the Latin American Free Trade Area or the Central American Common Market"--can be taken as part of a measure of educational structural differentiation. The two scales happen to be highly correlated--the ranking of nations on them tends to be similar. One would thus expect a few items from either scale to fit the other.

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[1] Ruth Young, Cornell University, Personal communication.

[2] Louis Guttman, "The Basis for Scalogram Analysis," Measurement and Prediction, Samuel A. Stouffer et al., Studies in Social Psychology in World War II, IV (Princeton: Princeton University Press, 1950), 85. On page 129 of the same work, Guttman notes: "Only a judgment of content can determine what belongs in a universe."

Yet having noted the importance of careful item selection there is little that can be said in a practical vein. Some insight into the nature of the problem can be gained from examining scales developed by others, for in this manner one may slowly get a "feel" for the process. Unfortunately, researchers developing scales rarely identify the items which were tried and discarded, and even more rarely note bases for rejection. This study will, therefore, note the complete list of items tried for construction of the final versions of the educational scales, and will also discuss a variety of items which were at one or another point considered for inclusion and eventually rejected.

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[1] These scales are presented in Chapters III and Appendix A.

The list of items which has been used in attempting to construct the scales of educational structural differentiation follows. This is obviously neither an exhaustive nor a random sample of possible items, but one of the useful characteristics of scalogram analysis is that neither of these is necessary. An attempt has been made, however, to tap most of the major sectors of educational systems, within the constraints of data availability.

Necessarily preliminary to choosing the final pool of items was a decision concerning the location of system boundaries. Inspection of the 44 items chosen should indicate that concern here is with what might be called the formal school system. Excluded from consideration are what can be labelled, to paraphrase Easton,[1] "para-educational" items--items which, while performing some sort of "educational" task, are not directly part of the formal school system. Thus, for example, various on-the-job training and union apprenticeship programs have been excluded from the system. Such programs are frequently ad hoc, organized for a particular group of trainees. But even if operating on a continuing basis, their systemic (communicative) links are typically not with other educational structural elements, but with other elements of the industrial or economic system, by which they have been organized, and within which they have been differentiated.[1] Similarly, research institutes have been considered part of the educational system only if they are connected with a university. Concern here is not with provisions made for research at any locus in a social system, but rather with the extent to which universities, as part of the formally organized educational system, have differentiated structural elements to perform the research task.

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[1] Easton, A Framework for Political Analysis, p. 52, ff.

It can of course be argued that "para-educational" items should be included within an educational system since they do, after all, appear to perform educational or quasi-educational tasks. Such a position does not eliminate the necessity of setting system boundaries.

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[1] Item 23 is designed in part to tap the existence of a structural element within the educational system which provides a formal linkage with para-educational programs of vocational or technical training.

Rather, it complicates the job. The distinction between the educational system and para-educational items, as drawn here, is fairly clearcut. If para-educational items are admitted into the educational system, a boundary must still at some point be set. At some point it must be decided that the interactions in a particular structural unit are so little educational that the unit does not fall within the educational system. To draw such a line with any conceptual legitimacy would be quite difficult. It would first of all require detailed information as to the nature of the interactions occuring within each candidate item, which information might be impossible to get for many societies. More importantly, it would require a very precise specification of what sorts of interactions would be taken to be educational and which non-educational. Considering the welter of controversy surrounding the questions of the nature of or definition of "education," such specification would be extremely difficult.[1]

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[1] The argument against the inclusion of para-educational items can be pushed a step farther. To suggest that all sets of interactions in a social system which are "educational" (however that term is defined) should be included in the educational system, is to suggest implicitly that all sets of interactions which are not clearly educational should be excluded. Thus, for example, one would be led to conclude that the purchasing or maintenance departments of a large school district

It is suggested that the simplest and most clearcut location of system boundaries is the one used here. Of course, since the ultimate test of a particular boundary setting, as noted in the preceding chapter, is utility, final judgment on this issue may be postponed until the results of analysis are reported in the following chapters.

Scale Items and Definitions

1. University: existence within country of institution of higher learning called "university;" colleges, non-integrated faculties, or university colleges not included.

2. University faculties of Biology, Chemistry and Physics: separate faculties or departments for all three disciplines.

3. University faculties of Sociology or Anthropology: separate faculties or departments of either discipline.

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should be excluded from the educational system, since the interactions occuring within them are more economic than educational. But what is of interest about such departments is the indication they give that certain of the activities involved with the acquisition and maintenance of material inputs for a segment of the educational system have apparently become so complex as to lead to the differentiation of separate structural elements to take care of them. Such input-related interactions do not cease to be part of the educational system, and become part of, say, the economic system, simply because they have become structurally differentiated. Similarly, on-the-job training activities in the economic system, or some segment thereof (e.g. a particular industry or factory), which can be considered to be part of the human input acquisition or maintenance activities of that system, do not cease to be part of the economic system simply because a separate structural unit has been established to take care of such training.

4. University faculty of Agronomy: separate faculty or department of agronomy or agriculture, excluding veterinary medicine.

5. University faculty of Education: separate faculty or department of education.

6. University faculty of graduate studies: separate faculty or department for study in any discipline(s) beyond the first university degree.

7. University research institute in agriculture: separate institute or department connected with a university whose primary or sole purpose is research in agriculture.

8. University research institute in social sciences: same as (7) in any social science field.

9. University research institute in physical-biological sciences: same as (7) in any of the physical-biological sciences, excluding institutes concerned with medical research.

10. University research institute in education: same as (7) in education.

11. University research institute in economics: same as (7) in economics.

12. University level school of librarianship: separate university level school devoted to training librarians.

13. Secondary school: any separate provision for secondary education.

14. Secondary vocational education: any provision for non-university preparatory secondary education (not necessarily in a separate school).

15. Secondary vocational school: secondary school whose primary purpose is not preparation for university admission.

16. Secondary commercial school: any secondary school whose purpose is to prepare students for commercial occupations.

17. Secondary industrial or crafts-trades school: same as (16) for occupations in industry or skilled crafts and trades.

18. Secondary agricultural school: same as (16) for agricultural occupations.

19. Secondary music school: same as (16) for music.

20. Secondary fine or visual arts schools: same as (16) for fine or visual arts.

21. Specialized secondary agricultural school: same as (16) for any agricultural specialty (e.g. cotton growing or livestock raising).

22. Specialized secondary industrial school: same as (16) for any particular industry (e.g. textile workers' school or railroad mechanics' school).

23. National apprenticeship commission: government-organized commission responsible for organizing and/or supervising apprenticeship training or technical education.

24. Military school: school at any level whose purpose is to prepare students for military careers.

25. Specialized military school: school at any level whose purpose is to prepare students for a military specialty (e.g. military communications or military aviation) or for a particular branch of the armed forces (e.g. naval academy or air force academy).

26. Pre-primary school: any pre-primary school.

27. Primary school: any primary school.

28. Rural primary school: school in rural area which differs from urban school(s) with respect to a) organization pattern or b) prescribed curriculum.

29. Special education class: any special provision for education of physically or mentally handicapped students (not necessarily in a separate school).

30. Special education school: separate school providing education at any level for physically or mentally handicapped students.

31. Special school for mentally handicapped: separate school providing education for mentally handicapped students.

32. Special school for blind: separate school providing education at any level for blind students.

33. Special school for physically handicapped other than blind: separate school providing education at any level for students with any physical handicap other than blindness.

34. Teacher training institution: any institution at either secondary or higher level which trains teachers for any level of education.

35. University level teacher training institution: separate university level institution which trains teachers for any level of education.

36. Separate training school for rural teachers: separate institution at any level which trains teachers for rural schools at any level.

37. Special pedagogical training for secondary teachers: any formal program (not ad hoc) to provide pedagogical training for secondary teachers.

38. Ministry: ministerial level body charged with general responsibility for education.

39. Inspectorate: indigenous corps of inspectors for any level of education.[1]

40. Curriculum agency: ministerial agency or group under ministerial supervision charged with responsibility for preparing curricula for any level or type of education.

41. Ministerial research division: separate division within ministry charged with responsibility for organizing and/or conducting educational research (excluding divisions whose responsibility is to collect and/or disseminate educational statistical data).

42. Ministerial audio-visual division: separate division within ministry charged with responsibility for producing and/or distribution of audio-visual instructional materials (excluding textbooks).

43. Ministerial advisory body: any formally constituted (not ad hoc) group charged with responsibility for advising the ministry on a regular basis.

44. National educational planning agency: agency connected with or part of the ministry charged with responsibility for producing national educational plans.

A number of items, several of which were included in an earlier published version of the scales,[2] were discarded, as the conception of structural differentiation

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[1] "Indigenous" refers to nationals of the particular country, and is used to exclude those cases where the school Inspection Staff is composed of foreign nationals.

[2] Adams and Farrell, Chapter 11, pp. 10-11.

became more precise, because they appear to tap different dimensions, such as segmentation, organization, or performance. Included among these are the following:

Items indicating segmentation

- More than one university
- Secondary education available outside metropolitan areas

Items indicating system organization

- Examinations required for university admission
- Member WCOTP
- Member International Bureau of Education
- Educational plan(s) integrated with general development plan

Items indicating system performance

- Production of educational films by Ministry
- Radio service to schools
- Official educational plan(s)
- Special training for educational planners
- Post-graduate degrees offered (in a variety of fields)
- At least 40 percent elementary students female
- At least 25 percent secondary students female

The last two items suffer from an additional problem; when using items having arbitrary cutting points, it is never clear whether the fit of the items into a scale is a reflection of their content or of the cutting points chosen.

Several other candidate items were discarded because data could not be found, or because it was impossible, given the available data, to develop a cross-culturally applicable definition.

Regional ministerial office
National agency to coordinate and/or supervise university level foreign study
In-service teacher training available
Professional teachers' organization
Locally produced texts
Parents' organization

The Universe of Nations

In any cross-national study it is necessary, if the results are to have any meaning at all, to limit one's efforts to some well-defined universe of nations. Because of the author's interest in the area, primary attention is paid to the nineteen Latin American nations which were autonomous before 1960. All of the candidate items are tested against this limited set. The scale developed is then extended, using only those items for which data are fairly readily available, to a larger set of social systems. This larger set consists of all those nations which are non-European or non-Western, which are usually classified as "developing" or under-developed," and which were autonomous before 1960.

Concentration upon a particular geographic or geocultural region is not merely the child of convenience and whim. There is considerable evidence to suggest that many relationships between variables which may be important in a study such as this vary considerably from geographic area to area. For example, Russet[1] found a strong and significant (.001 level) relation between urbanization and primary-secondary enrollment ratios, among a world-wide sample of societies. Using his data, and considering the matter area by area, the following variations in the relationship are found: Asia--.48, Africa--.41; Middle East--.32; Latin America--.56.[2] As a further example of this phenomenon it has been calculated, using Ginsburg's data, that the relation between urbanization and literacy varies from .12 to .46 and between urbanization and GNP per capita from .02 to .58 when Africa, Asia and the Middle East are separately considered.[1]

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[1] Bruce Russett _et_ _al_., _World_ _Handbook_ _of_ _Political_ _and_ _Social_ _Indicators_ (New Haven: Yale University Press, 1964), p. 283.

[2] The statistic used for these calculations, Kendall's Tau, is not the statistic used by Russett. These coefficients are thus not directly comparable to Russett's. This makes no less apparent the differences between regions.

That such variations should be found is hardly surprising, considering 1) that there are gross differences between regions observable on many variables (on many variables, if all the nations are ranked, it will be found that there is a tendency for "bunching"--most Latin American nations close together, most Asian nations close together, etc.), and 2) that such regions tend to have common cultural heritages, the effects of which are difficult to identify, let alone control statistically. That the effect of these uncontrolled regional variations can be of importance is noted by Ruth Young.

> It is even possible for hypotheses that hold within each of several culture areas to be reversed when tested on the universe without controlling on culture area. Such reversals are not reversals of theory, but require explanation

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[1] Norton S. Ginsburg, Atlas of Economic Development (Chicago: University of Chicago Press, 1961), pp. 34 and 38. These calculations, by the present author, were originally reported in Adams and Farrell, Chapter 8, p. 32.

> in terms of additional variables deriving from the nature of the cultural differences.[1]

Concerning the composition of the larger set of nations several points can be made. Western or developed nations are excluded from the set because their extreme values on many data series can influence correlations over much, hiding smaller differences between developing nations. Moreover, the interest of the present writer focuses on problems of education and national development or modernization. It is assumed here that the quantitative differences between most developed societies and most developing societies are, on many crucial development-related indices, so great as to be transformed into qualitative differences.

The policy adopted here has been followed in studies by Almond and Coleman[2] and Ruth Young,[3] for similar reasons. A particularly unfortunate example of the studies which have not followed this practice, and have instead thrown all nations into one statistical pot, is Banks and Textor's massive volume of computer printout.[1] The difficulty is compounded in that work by the use of dichotomies. As one would expect, on most dichotomies the West is found in one half, the rest in the other. As Ruth Young has noted, "Such findings are doubtless true, but add little to the common sense generalizations any intelligent person might make without complex aids to reasoning such as computers and tests of significance."[2]

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[1] Ruth Young, pp. 21-22.

[2] Gabriel Almond and James S. Coleman, The Politics of Developing Areas (Princeton: Princeton University Press, 1960).

[3] Ruth Young, particularly pp. 18-19.

The 1960 cut-off date used here is not entirely arbitrary. The many nations which have gained independence since then are typically still in a state of flux sufficient to make it difficult to determine what institutions are in fact present. Moreover, due to lags in both data acquisition and data reporting in many developing nations, 1960 (give or take a year or two) was the latest date for which data on most variables of interest here were available for most nations. Much of the analysis will therefore deal with conditions as of 1960 and earlier, which naturally excludes societies which were not then, or had just become, independent.

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[1] Arthur S. Banks and Robert B. Textor, A Cross-Polity Survey (Cambridge, Mass.: The M.I.T. Press, 1963).

[2] Ruth Young, p. 19.

The list of non-Western developing nations autonomous before 1960 follows:

Afghanistan
Argentina
Bolivia
Brazil
Burma
Cambodia
Ceylon
Chile
China (Taiwan)
China (Mainland)
Colombia
Costa Rica
Cuba
Dominican Republic
Ecuador
El Salvador
Egypt
Ethiopia
Ghana
Guatemala
Guinea
Haiti
Honduras
India
Indonesia
Iran
Iraq
Jordan
Laos
Lebanon
Liberia
Libya
Mexico
Morocco
Nepal
Nicaragua
North Korea
North Vietnam
Pakistan
Panama
Paraguay
Peru
Phillipines
Saudi Arabia
South Korea
South Vietnam
Sudan
Syria
Thailand
Tunisia
Turkey
Uruguay
Venezuela
Yemen

Of the 54 nations on this list, five were excluded from analysis because data were not available and/or because their chaotic internal state makes judgment as to what exists at any point in time difficult: Mainland China, Cuba, North Korea, North Vietnam and South Vietnam. The remaining 49 nations constitute the set.

The Testing of Relationships

The descriptive patterns made manifest by scalogram analysis may be interesting, and may prove useful. But scalogram analysis is primarily a measurement technique--its principal purpose is to develop unidimensional measures or scales of concepts. The construction of a measure, however unequivocal, is of little value unless the measure is used to examine the relationships between its referent concept and other concepts. That is, knowing that Argentina has a structurally more differentiated educational system than does Venezuela, or that Ecuador's system is more differentiated than that of Peru, may be interesting in itself. But what is of most value to students of comparative education is finding out why, and what difference it makes.

The Problems Encountered

As noted, this study has been conducted from a social systems analytic point of view. The conceptual model for this work is a loosely organized aggregate of definitions and categories, suggesting some general types of relationships which should be considered, but in only a few areas being well-enough developed to suggest specific hypotheses. It is thus advisedly called a "point of view" or a "frame of reference," rather than a theory. There is not a set of propositions relating carefully defined variables, logically organized (axiomatized), which explicitely suggests a number of potentially fruitful hypotheses for testing. Consequently, in this work there is some testing of hypotheses, but also much initial exploration of possible relationships.

This systems perspective does present an extremely complex view of the social world, pointing to complicated information exchanges, within the system and between the system and its environment, with feedback processes mediated by a variety of environmental systems, over varying lengths of time. To attempt to sort out all these complex interactions, to specify all the variables involved, and try to discover the shape and strength of their interaction, would be, at this juncture, an impossible task.

In the first place the necessary research methodology is not available. In Buckley's words:

> Research methodology has hardly begun to think beyond relatively simple traditional statistical techniques to the methods needed to get at a system of complexly interacting parts. . .we must leave it to the expert methodologist to provide us with a much needed treatise on the research implications of modern (especially non-equilibrial) social systems analysis.[1]

The limits of available analytic techniques do not by themselves, however, set the boundaries of the possible in a cross-national study such as this. The nature of the available data is another serious constraint.

There are on the one hand many data series whose *precise conceptual referent* is unclear--whose validity as measures is questionable. GNP per capita, perhaps the classic measure of economic development, has long been recognized to suffer from this shortcoming. In the mid-1950's, West Germany and Venezuela had exactly the same GNP per capita in $U.S.[2] But because the figure is in one case the result of great wealth in one sector, oil, offsetting little wealth in other sectors, while it is in the other case a reflection of a fairly even and widespread wealth, in what ways were these two countries equally developed? And in what ways can one say that they were both more developed than the Netherlands and the Soviet Union, both of which had lower GNP per capita figures? It is simply not clear to what concept these data, as a measure of development, refer. Moreover, even if considered simply to measure the "total of the market value of all 'final' goods and services produced during a year,"[1] GNP figures are still equivocal. There are a variety of operational definitions of GNP in use (for example an effort may or may not be made to include the subsistence sector), and it is difficult to determine which has been used in a given case.

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[1] Buckley, p. 67.

[2] Ginsburg, Table 3, p. 18.

Additionally, many concepts which might be of interest are not yet measurable, either because data are as yet unavailable, or because the concept itself is not precisely defined, and it is thus not clear what sort of data would be appropriate. The clearest case in point relative to educational systems revolves around the question of system output. The output of an educational system is intangible, something "added to" students as they pass through the system. Gross has spoken to the difficulty of measuring output in such a system.

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[1] Charles Benson, The School and the Economic System (Chicago: Science Research Associates, Inc., 1966), p. 12.

> Here the first problem is not counting but identification. This is extremely difficult in all cases of intangible services with blurred boundaries. It is particularly difficult when--as is usually the case with vital government activities of a regulatory or informational nature--conflicting conceptions of what the service should be result in divergent views as to what it actually is. . . .Under such circumstances one has no choice but to use one or more 'quantity surrogates.' The total set of such surrogates is composed of the following:
>
> 1) The number of clients (such as students in school or patients in hospitals).
>
> 2) The duration of service (such as student-hours or bed-days).
>
> 3) The number of intermediate or subsequent products (letters answered, reports prepared, bed pans emptied, and examinations passed).
>
> 4) Input factors (number of teachers or doctors, total costs of services provided).[1]

Even if one takes the view that the output of schooling is adequately measured by academic achievement tests,[2] it is clear that it will be a long time before the data necessary to construct cross-national measures of many types of achievement for many countries will be available.

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[1] Gross, pp. 237-38.

[2] Such a position ignores, of course, the non-cognitive effects of schooling, which may be more important than the cognitive.

This lack of fit between data and concepts appears to derive to a considerable extent from the fact that little of the extant data on developing societies have been generated by or for scholars seeking to measure carefully defined concepts and to verify theoretical propositions.[1] Most available information is the fallout of endeavors undertaken for domestic political or economic reasons, or international melioristic purposes. There are, for instance, census reports, statistics collected by various government agencies in order to carry on their own work, data collected under the aegis of and assembled by such international agencies as Unesco, the OAS and FAO. In addition to such results of national or international bookkeeping, Rokkan has distinguished two other broad categories of data available for cross-national comparisons: "process-produced data" and the data of observations and descriptions.[2]

The first of these encompasses information "generated through the very processes of living, working, interacting. . .--from plain material evidence through all kinds of artifacts to the varieties of symbolic representations of ideas, activities, and events, whether drawings, tales, messages, or documents."[1] The second category ranges from the ideosyncratic and anecdotal records of casual travellers, across the works of native lawyers, historians and other record keepers, to the systematic observations of linguists, ethnographers, and other wandering scholars.[2]

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[1] The focus here is upon national systems. These comments may apply with less force to sub-national units in some cases.

[2] Stein Rokkan (ed.), Comparing Nations (New Haven: Yale University Press, 1966), pp. 4-5.

Although a wealth of such non-theory-generated data are available, the analyst who wishes to use them is faced with a serious problem. These data do not usually come arranged in neat categories appropriate to the concepts which may be of interest. Oskar Morgenstern, speaking of economic data, put the matter this way:

> Economic statistics are not, as a rule, the result of designed experiment. . . .In general, economic statistics are merely by-products or results of business and government activities and have to be taken as such, even though they may not have been selected and designed for the analyst's purpose. Therefore, they often measure, describe, or simply record something that is not exactly the phenomenon in which the economist would be interested.[3]

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[1] Ibid.

[2] In this category would fall the descriptive country reports which form so large a part of the literature of comparative education.

[3] Oskar Morgenstern, The Accuracy of Economic Observations (1st revised ed.; Princeton, N.J.: Princeton University Press, 1963), pp. 13-14. Cited by Gross, p. 166.

Added to the problems just noted is the notorious lack of accuracy of much cross-national data. The typical practice in cross-national studies has been to admit that the data are of questionable reliability and then proceed as though they weren't. In Ginsburg's volume the reliability of various data series is discussed in some detail, and in Russett's work the error margin of each series is estimated, but such efforts are rare. Although the efforts of the United Nations to standardize the definitional basis for various enumerations has improved the quality of some data series, most data for most countries must still be regarded with suspicion.

The Solutions Devised

There are a variety of ways of dealing with the several problems noted above. First, it is desirable to follow a general principle of keeping the analytic techniques simple. Complex multi-variate and factor analyses will be avoided. If one is not sure what each of several data series measures, it is difficult to ascribe meaning to complex combinations of them. The results of Berry's factor analysis of some 43 social and economic variables, reported in Ginsburg, are instructive. Four dimensions or factors were isolated. The first, called a "technological scale" because it was most affected by variables involving modern technology, summarized "an extremely strong average effect present in all 43 indices."[1] The second factor was called a "demographic scale" because it was highly influenced by such variables as mortality and natality rates and population growth rate. This title is open to question, however, since the dimension was also strongly affected by such variables as rice yield and telephones per capita, whose classification as demographic variables is a bit odd. The third factor was said to reveal "contrasts in national income and external relations."[2] Such a conclusion is acceptable only if one examines the distribution of countries involved and ignores the variables which most affect the dimension. The common content in the variables related to this factor is inscrutable.[3] Finally, a size factor was found, which picked up the statistical bias introduced when data series are standardized by dividing either by population or area.

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[1] Ginsburg, p. 113.

[2] Ibid., p. 116.

[3] The eight variables most closely associated with the factor, in order of importance, are population growth rate, crude birth rate, energy consumption, foreign trade per capita, freight ton-km. per km. of railroad, national product, motor vehicles per unit of road, and motor vehicles per capita. Ibid., p. 113.

> In sum, then, the computer tells us that the 43 variables deal with some social process which has technological and demographic aspects; that size is a factor to be considered, because it affects some indicators more than others; and that something else is going on that we cannot figure out yet.[1]

This represents a rather limited improvement over common sense.

The recently published results of the largest cross-national factor analysis to date[2] support the position taken here. Rudolph Rummel and his associates in the Dimensionality of Nations project, after several years work, have been informed by the computer that some forty percent of the variance in a matrix of 236 variables is accounted for by three dimensions: size, wealth, and politics. Thus, nations are found to differ largely in relation to how big they are, how rich they are, and whether they are western, neutral or communist.

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[1] Adams and Farrell, Chapter 8, p. 14. The discussion of factor analysis in the Adams and Farrell volume is based upon an unpublished working paper by Kurt Finsterbusch, Columbia University, Bureau of Applied Social Research.

[2] Jack Sawyer, "Dimensions of Nations: Size, Wealth, and Politics," American Journal of Sociology, LXIII (September, 1967), 145-72.

The nature of the available data also suggest the type of statistic that should be used to assess the association between variables. A rank correlation statistic, Kendall's Tau, has been chosen. Because scalogram analysis produces a ranking of nations, a rank order statistic is called for in assessing relations between educational structural differentiation and any other variables which are Guttman scaled, as several are. In order easily to compare the findings of the study one with another it is useful to have the same statistic for assessing all relationships.

Use of a rank order statistic has additional advantages. It does not require the assumption that the data are normally distributed on the variables involved, as does the more commonly used Pearson Product-Moment correlation coefficient. The data series used in this study are not typically normally distributed. Moreover, ranking minimizes the effect of error in the original information. The range of most series used here is so wide, even among the small sets of nations considered, that it requires a very large error in most cases to change a nation's rank to any extent.

Tau has several advantages over the more generally used rank correlation statistic, Spearman's rho: 1) it is easier to compute; 2) it has both a partial and multiple correlation coefficient; and 3) it has a more meaningful interpretation as a descriptive statistic.

This last point needs amplification. When two variables to be associated are both ranked, the classical theory of linear regression, upon which correlation coefficients are based, is not applicable (for example, the *square* of a rank order statistic cannot be interpreted as proportion of variance accounted for in the underlying variables).[1] The Spearman coefficient *is*, however, a correlation coefficient, treating the ranks of subjects as though they were scores, and is thus meaningful only by a rather spurious analogy with the standard product-moment correlation coefficient.[1] Kendall's Tau, on the other hand, is not a correlation coefficient, in the classical meaning (although for convenience the relations between variables assessed in this study will often be called correlations). It measures directly the degree of "agreement" or association between two rankings. Essentially, it expresses the difference between two proportions: 1) the proportion of pairs of individuals having the same relative order in both rankings; and 2) the proportion of pairs of individuals having different relative order in the two rankings. Tau thus measures directly the extent to which two rankings tend to be similar. A Tau of .62, for example, may be interpreted as follows:

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[1] William L. Hays, *Statistics for Psychologists* (New York: Holt, Rinehart and Winston, 1963), p. 642. Costner has shown however, that if there are no ties in either variable the *absolute value* of Tau indicates the proportional reduction in error of estimation made possible by the relationship. Herbert L. Costner, "Criteria for Measures of Association," *American Sociological Review*, XXX (June, 1965), 347.

> If a pair of objects is drawn at random from among those ranked, the probability that these two objects will show the same relative order in both rankings is .62 more than the probability that they would show different order. In other words from the evidence at hand it is a considerably better bet that the. . .randomly selected pair (will be ordered) in the same way than in a different way.[2]

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[1] Hays, p. 651.

[2] Ibid., p. 649.

Thus values of Kendall's Tau are not comparable directly to values of the Pearsonian r or Spearman's rho. Typically, values of Tau are considerably lower than the others. Moran has stated that for most rankings Tau is about 2/3 of rho.[1]

Tau has two disadvantages. First, it has a large standard error. Consequently, little importance can be attached to small differences between coefficients obtained. Additionally, when there are ties in the rankings on either variable, as is characteristic of many of the variables considered in this study, the interpretation of Tau is less clear. A closely related measure of rank association which avoids this last difficulty is Goodman and Kruskal's Gamma.[2] However, for this study, the existence of published partial and multiple coefficients for Tau (there are none for Gamma) argue persuasively in its favor. Moreover, the added clarity of interpretation achieved by using Gamma may not have a great deal of practical significance. For most of the simple relationships assessed in this study both Tau and Gamma have been calculated. In the vast majority of cases the two coefficients were identical or very nearly so.[1]

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[1] P. A. P. Moran, "Partial and Multiple Rank Correlation," Biometrika, 38, 1951, p. 27.

[2] Leo A. Goodman and William H. Kruskal, "Measures of Association for Cross Classification," Journal of the American Statistical Association, XLIV (December, 1954), 747-754; Leo A. Goodman, "On Statistical Analysis of Mobility Tables," American Journal of Sociology, LXX (March, 1965); cf. also Hays, p. 655.

In this type of study, tests of statistical significance are irrelevant, and hence will not be used. Significance tests are part of the mechanics of statistical inference, reasoning from the characteristics of an observable sample to the characteristics of an unobservable population. Here, either the total universe is considered, or a patently non-random sample. Indeed, it is assumed, as was noted earlier, that many of the relationships explored will differ from one to another geographic area, and from any area to the total set. At any rate, such differences, or similarities, between areas are matters for empirical investigation rather than statistical estimation. The total population is not unobservable.

Some authors, admitting all of the above, nonetheless use levels of significance, on the grounds that they can at least help sort out relationships which are misleading because based on a small number of cases, a weak coefficient, or both.[1] Bakan's argument against this practice is accepted here.

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[1] Gamma and Tau were both calculated for 538 of the more than 700 simple associations assessed for this study. In 94% of the cases, the two were either identical or differed by less than .02. In only ten cases was the difference greater than .04.

> There is even the practice of using tests of significance in studies of total populations, in which the observations cannot by any stretch of the imagination be thought of as having been randomly selected from any designable population. Using the p value in this way, in which the statistical inference model is even hinted at, is completely indefensible, for the single function of the statistical inference model is making inferences to populations from samples.[2]

Interest in this study will be centered on whether a relationship is meaningful or trivial. This forces the author and the reader to judge, in relation to their own prior expectations concerning a relationship, the importance of a given statistical result, or set of results. To provide some handle on the practical significance of the findings, whenever possible _patterns_ of relationships will be examined. For example, if educational structural differentiation is correlated with twenty measures of industrialization or urbanization, and only one or two of the coefficients are high, and most are quite low, we have reason to suspect that the relationship has little significance. If, however, most of the twenty coefficients are high, at about the same level, and in the same direction, there is reason to consider the relationship important.

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[1] Russett, p. 263.

[2] David Bakan, "The Test of Significance in Psychological Research," _Psychological Bulletin_, LXVI (December, 1966), p. 428; for another attack on the use of significance tests, see Hanan C. Selvin, "A Critique of Tests of Significance in Survey Research," _American Sociological Review_, XXII (1957), 519-527.

It will be noted that no attempt has been made to construct a complete correlation matrix, listing all relationships between all variables considered. To the extent that there is interdependence among the variables in question--and both systems theory and previous statistical studies suggest that there is--the values on some relationships will set lower limits on others. Thus, in any large intercorrelation matrix one is bound to get some spuriously high results. Hays has illustrated this phenomenon:

> Consider a sample of N cases, each of which gives three scores, X_1, X_2, and X_3. Imagine that r_{12} turns out to be -.80, and r_{13} is also -.80. What is the smallest value that r_{23} can be? The very smallest value that r_{23} can show for these data is .10. Fixing the value of two of the correlations determines the necessary lower limit for the third. The values of inter-correlations are dependent upon each other in a given sample.[1]

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[1] Hays, p. 577. This is particularly a serious problem if statistical significance tests are being used for all coefficients in the matrix.

Thus, the strategy in this study will be to consider statistically only those relationships which may have relevance to a particular problem. Limited hypotheses will be suggested, and limited questions will be asked, and only such data as may help with these will be statistically manipulated.

Data on all the variables to be considered in this study are available for approximately 1960. It is commonplace to note that synchronic relationships tell nothing about causation, or direction of effect, and little about primacy of effect. To get at these matters one needs, at the least, measures of the same variables at different points in time, and hopefully time series data. For most of the major variables of concern here some data for 1950 as well as 1960 have been found, for the Latin American nations. The general strategy will be to use the abundant 1960 data for Latin America to provide initial tests of some broad hypotheses and to suggest relationships which may be of interest. These results will be replicated for 1950 in Latin America, and in a limited fashion for the total set of 49 nations for 1960. Based upon the results of the synchronic analysis a limited number of specific hypotheses and questions will be formulated for testing over time. Simple, two variable, associations will generally be calculated, supplemented in a few important cases with multiple correlations, and, in a very few cases, with partial correlations.

CHAPTER III

THE MEASUREMENT OF STRUCTURAL DIFFERENTIATION OF EDUCATIONAL SYSTEMS

The forty-four candidate items listed in the preceding chapter have been tested against the educational systems of the nineteen autonomous Latin American nations, for 1960. Table 3 presents the resulting scalogram. Table 4 lists the items which make up this scale, according to scale step, noting for each item the proportion of the nineteen nations it discriminates and the scale error to which it is subject. The coefficient of reproducibility for this scale is .91, the coefficient of scalability, .69--both above the accepted minimums. When the coefficient of reproducibility is recalculated using only items with fewer than eighty percent of the responses in the modal category, it remains at .91. Inspection does not reveal any consistent non-random error pattern running through the scalogram which would invalidate it.

Haiti has the least differentiated educational system, Brazil and Chile the most differentiated. Simply

TABLE 3

SCALOGRAM OF EDUCATIONAL STRUCTURAL DIFFERENTIATION LATIN AMERICA 1960[a]

C.R. = .91 C.S. = .69 using items with -80% in modal category .91	Ministry, etc.	Pedagog. trng. sec. teachers	Special education class	Special education school	Ministerial advisory body	Secondary agricultural school	Univ. level tchr. trng. inst.	Military school	Research inst. phys.-bio sci.	Research inst. social science	National apprenticeship comm.	Univ. level sch. librarianship	National educ. planning agency	Ministerial research division	Research inst. agriculture	Research inst. economics	Specialized military school	Univ. facs. bio, chem, phys.	Ministerial A-V division	Univ. facs. soc. or anth.	Graduate faculty	Specialized industrial school	Research inst. education
Haiti	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Gautemala	X	X	X	X	X	X	O	X	O	X	O	X	O	O	O	O	O	O	O	O	O	O	O
Nicaragua	X	O	X	X	X	X	O	X	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O
Costa Rica	X	X	X	X	X	X	X	O	O	O	O	O	O	O	X	O	O	O	O	O	X	O	O
Paraguay	X	X	X	X	X	X	X	O	O	O	O	O	X	X	O	O	O	O	O	O	O	O	O
Honduras	X	O	X	X	O	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
El Salvador	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Dominican Rep.	X	X	X	X	X	O	X	O	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O
Bolivia	X	X	X	X	O	X	X	X	X	X	O	O	O	O	O	X	O	O	O	O	O	O	O
Peru	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O	O	X	O	O	O	O
Panama	X	X	X	X	X	X	O	O	O	X	O	X	X	O	O	O	O	O	O	O	O	O	O
Colombia	X	X	X	X	X	X	X	O	X	X	X	X	X	X	O	O	O	X	X	X	O	O	O
Uruguay	X	X	X	X	O	X	X	X	X	X	X	X	O	X	X	X	O	O	X	O	O	O	O
Venezuela	X	X	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	X	X
Ecuador	X	X	X	X	X	X	O	X	X	X	O	X	X	X	X	X	X	X	O	O	O	O	O
Mexico	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Argentina	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Brazil	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X
Chile	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X

[a] For sources of data see Appendix B.

TABLE 4

SCALE OF EDUCATIONAL STRUCTURAL DIFFERENTIATION: LATIN AMERICA 1960

Step No.	Item	Proportion Having Item	Error
1.*	Ministry	1.00	-
	University		
	Teacher training institution		
	Inspectorate		
	Curriculum agency		
	Pre-primary school		
	Primary school		
	Secondary school		
	Secondary vocational education		
	Secondary vocational school		
	Secondary commercial school		
	Secondary industrial or crafts-trades school		
2.	Special pedagogical training for secondary teachers	.90	2
	Special education class	.95	1
	Special education school	.95	1
3.	Ministerial advisory body	.80	3
4.	Secondary agricultural school	.90	1
5.	University level teacher training institution	.74	2
6.	Military school	.68	4
	University research institute in physical-biological sciences	.63	1
7.	University research institute in social sciences	.68	1
8.	National apprenticeship commission	.42	2
	University level school of librarianship	.58	1
9.	National educational planning agency	.42	3
10.	Ministerial research division	.47	1
11.	University research institute in agriculture	.47	3
	University research institute in economics	.37	2

*The items in Step 1 are not properly part of the scale as they are present in all nineteen nations. They are included to give a complete picture, but are not used in computing coefficients of reproducibility or scalability.

TABLE 4--Continued

Step No.	Item	Proportion Having Item	Error
12.	Specialized military school	.37	1
13.	University faculties of Biology, Chemistry and Physics	.32	1
14.	Ministerial audio-visual division	.37	3
	University faculties of Sociology or Anthropology	.26	1
	University faculty of graduate studies	.26	1
	Specialized secondary industrial school	.31	1
15.	University research institute in education	.16	1

to indicate that Brazil has a more differentiated educational system than does Haiti is to add little to common knowledge. But the scalogram makes finer distinctions. It provides an unequivocal ranking of the nineteen nations, such that one knows exactly which items each nation has and which it does not possess. Moreover, it indicates specifically the manner in which nations with differing ranks differ. For example, it indicates not only that El Salvador ranks higher than Costa Rica, Paraguay, and Honduras, but also that the higher ranking results from the presence in El Salvador of all the items possessed by the other three nations (scale errors aside) plus a military school and a research institute in the physical-biological sciences. Similarly, the scalogram demonstrates not only that Mexico and Argentina have more differentiated educational systems than Ecuador. It also specifies the four items--ministerial audio-visual division, university faculties of sociology or anthropology, graduate faculty, and specialized industrial school--which account for the difference.

One of the fundamental questions asked in this study has been answered. It is possible to use the Guttman scalogram analysis technique to measure the structural differentiation of educational systems. Tables 3 and 4, however, provide not only a measure, a ranking of nations along the dimension, educational structural differentiation, but also a partial description or explication of the extent of structural differentiation in the educational systems of the Latin American region as of 1960. The two tables indicate which structural elements are almost universally present and which are found almost nowhere in this region. The twelve items in scale step 1 are threshold items, present in all the systems. The remaining twenty-two items, discriminating from ninety-five percent of the systems to sixteen percent of the systems, form the scale proper.

Conclusive demonstration of the validity-reliability of a measure such as this is difficult to achieve.[1] Several reasons for considering this scale a reasonably valid and reliable measure of the level or extent of structural differentiation at a particular point in time have been discussed in the early pages of the preceding chapter. However, in considering this scale an additional problem presents itself. Of the forty-four candidate items, ten do not fit: university, faculty of agronomy, university faculty of education, secondary music school, secondary fine or visual arts school, specialized secondary agricultural school, rural primary school, special school for mentally handicapped, special school for blind, special school for physically handicapped other than blind, and separate training school for rural teachers. The lack of fit of these items might reflect problems of definition and consequent coding mistakes, or it might indicate that these items do not have sufficient content in common with the items on the scale to be considered as part of the structural differentiation of the total system. Assuming the latter alternative to be the case, the possibility is raised that these items are parts of other dimensions, which are either (1) sub-dimensions of educational structural differentiation whose content is not completely summarized by the wider dimension, or (2) dimensions of systems other than the educational system.

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[1] There being no other measures of the structural differentiation of educational systems, it has not been possible to run statistical validity checks. For a useful discussion of these matters see Donald T. Campbell and Donald A. Fiske, "Convergent and Discriminant Validation by the Multitrait, Multimethod Matrix," Psychological Bulletin, LVI (March, 1959), pp. 81-105.

In order to explore these possibilities those items from the original pool relating to secondary education and higher education (including in the latter group those ministerial items which appear to require specialized high level manpower) have been separated out. The resulting scalograms and scales are found in Tables 5, 6, 7 and 8. It was thought that the separate scale of higher education structural differentiation might include the two "left-over" items relating to higher education: faculty of agronomy and faculty of education. It does not. It was similarly thought that the separate scale of secondary education items might include the "left-over" secondary items: music school, fine or visual arts school, and specialized agricultural school. As Tables 7 and 8 show, this is the case.

Further inspection of the ten items not included in the full scale suggested that there might be separate sub-dimensions referring to the differentiation of agricultural or rural education elements and special education elements. This turned out to be the case. The scalograms are reported in Tables 9 and 10. These last two are not truly scales, as they have too few items. For dichotomous items, nine or

TABLE 5

SCALOGRAM OF STRUCTURAL DIFFERENTIATION OF SECONDARY EDUCATION LATIN AMERICA 1960[a]

C.R. = .94 C.S. = .76 C.R. using only items with -80% modal category .93	Industrial & Comm. School	Special pedagog. trng. for secondary teachers	Agricultural school	Fine-visual art school	Music school	Military school	Specialized military school	Specialized industrial sch.	National apprenticeship com.	Specialized agric. school
Haiti	X	X	O	X	O	O	O	O	O	O
Bolivia	X	X	X	O	O	X	O	O	O	O
Peru	X	X	X	O	O	X	O	O	X	O
El Salvador	X	X	X	O	O	X	O	O	O	O
Costa Rica	X	X	X	O	O	O	O	O	O	O
Paraguay	X	X	X	X	O	O	O	O	O	O
Honduras	X	O	X	X	X	O	O	O	O	O
Dominican Republic	X	X	O	X	X	O	O	O	O	O
Panama	X	X	X	X	X	O	O	O	O	O
Colombia	X	X	X	X	X	O	O	O	X	O
Guatemala	X	X	X	X	X	X	O	O	O	X
Ecuador	X	X	X	X	X	X	X	O	O	O
Nicaragua	X	O	X	X	X	X	X	O	O	O
Chile	X	X	X	O	X	X	X	X	X	O
Brazil	X	X	X	X	X	X	X	X	X	O
Uruguay	X	X	X	X	X	X	O	X	X	X
Venezuela	X	X	X	X	X	X	X	X	X	X
Mexico	X	X	X	X	X	X	X	X	X	X
Argentina	X	X	X	X	X	X	X	X	X	X

[a] For sources of data see Appendix B.

TABLE 6

SCALE OF SECONDARY EDUCATION STRUCTURAL DIFFERENTIATION LATIN AMERICA 1960

Step No.	Item	Proportion Having Item	Error
1.*	Secondary industrial or crafts-trades school	1.00	-
	Secondary commercial school	1.00	-
2.	Special pedagogical training for secondary teachers	.90	2
3.	Secondary agricultural school	.90	1
4.	Secondary fine or visual arts school	.74	2
5.	Secondary music school	.68	0
6.	Military school	.63	3
	Specialized military school	.37	1
7.	Specialized industrial school	.31	0
	National apprenticeship commission	.42	2
8.	Specialized agricultural school	.26	1

* The items in Step 1 are not properly part of the scale, being present in all nineteen nations. They are included to give a complete picture, but are not used in computing coefficients of reproducibility or scalability.

TABLE 7

SCALOGRAM OF HIGHER EDUCATION STRUCTURAL DIFFERENTIATION LATIN AMERICA 1960[a]

C.R. = .94 C.S. = .69 C.R. using only items with -80% in modal category .94	University	Univ. level tchr. trng. inst.	Res. inst. phys.-bio sciences	Res. inst. social science	Univ. level. sch. librarianship	Research inst. agriculture	Research inst. economics	Ministerial research division	National educ. planning agency	Fac. bio., chem., and physics	Ministerial A-V division	Faculties sociology or anth.	Graduate faculty	Research inst. education
Haiti	X	O	O	O	O	O	O	O	O	O	O	O	O	O
Nicaragua	X	O	O	O	O	O	O	O	O	O	O	O	O	O
Panama	X	O	O	X	X	O	O	O	X	O	O	O	O	O
Guatemala	X	O	O	X	X	O	O	O	O	O	O	O	O	O
Paraguay	X	X	O	O	O	O	O	X	X	O	O	O	O	O
Honduras	X	X	O	O	O	O	O	O	O	O	O	O	O	O
Costa Rica	X	X	O	O	O	O	O	O	O	O	O	O	X	O
El Salvador	X	X	X	O	O	O	O	O	O	O	O	O	O	O
Dominican Rep.	X	X	X	X	O	O	O	O	O	O	O	O	O	O
Bolivia	X	X	X	X	O	O	X	O	O	O	O	O	O	O
Peru	X	X	X	X	X	X	O	O	O	O	X	O	O	O
Uruguay	X	X	X	X	X	X	X	X	O	O	X	O	O	O
Venezuela	X	X	X	X	X	X	X	X	X	O	O	O	O	X
Ecuador	X	O	X	X	X	X	X	X	X	X	O	O	O	O
Colombia	X	X	X	X	X	X	O	X	X	X	X	X	O	O
Argentina	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Mexico	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Chile	X	X	X	X	X	X	O	X	X	X	X	X	X	X
Brazil	X	X	X	X	X	X	X	X	O	X	X	X	X	X

[a] For sources of data see Appendix B.

TABLE 8

SCALE OF HIGHER EDUCATION STRUCTURAL DIFFERENTIATION LATIN AMERICA 1960

Step No.	Item	Porportion Having Item	Error
1.[a]	University	1.00	-
2.	University level teacher training institution	.74	1
3.	University research institute in physical-biological sciences	.63	0
4.	University research institute in social sciences	.68	2
5.	University level school of librarianship	.58	2
	University research institute in agriculture	.47	0
6.	University research institute in economics	.37	3
7.	National educational planning agency	.47	2
	Ministerial research division	.47	1
8.	University faculties of biology, chemistry and physics	.32	0
9.	Ministerial audio-visual division	.37	2
	University faculties of sociology or anthropology	.26	0
10.	University faculty of graduate studies	.26	1
11.	University research institute in education	.16	1

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[a] The item in step 1 is not properly part of the scale, being present in all nineteen nations. It is included to give a complete picture, but is not used in computing coefficients of reproducibility or scalability.

TABLE 9

SCALOGRAM OF SPECIAL EDUCATION STRUCTURAL DIFFERENTIATION LATIN AMERICA 1960[a]

C.R. = .97 C.S. = .83	Special educ. class	Special educ. school	Special school mentally handicapped	Special school blind	Spec. school handicap other than blind
Venezuela	O	O	O	O	O
Haiti	X	X	O	O	O
Costa Rica	X	X	O	O	O
Dominican Republic	X	X	O	X	O
Honduras	X	X	O	X	O
Ecuador	X	X	X	O	O
Mexico	X	X	X	O	O
Nicaragua	X	X	X	O	O
Paraguay	X	X	X	X	O
Guatemala	X	X	X	X	X
El Salvador	X	X	X	X	X
Bolivia	X	X	O	X	X
Colombia	X	X	O	X	X
Argentina	X	X	X	X	X
Brazil	X	X	X	X	X
Chile	X	X	X	X	X
Panama	X	X	X	X	X
Peru	X	X	X	X	X
Uruguay	X	X	X	X	X

[a] For sources of data see Appendix B.

TABLE 10

SCALOGRAM OF AGRICULTURAL EDUCATION STRUCTURAL DIFFERENTIATION LATIN AMERICA 1960[a]

C.R. = .96 C.S. = .84	Secondary agric. school	Univ. fac. agronomy	Univ. res. inst. agric.	Special secondary agricultural school
Haiti	O	O	O	O
Dominican Republic	O	O	O	O
Panama	X	O	O	O
Paraguay	X	O	O	O
El Salvador	X	O	O	O
Nicaragua	X	X	O	O
Guatemala	X	X	O	X
Bolivia	X	X	O	O
Honduras	X	X	O	O
Colombia	X	X	O	O
Peru	X	O	X	O
Ecuador	X	O	X	O
Brazil	X	X	X	O
Costa Rica	X	X	X	O
Chile	X	X	X	O
Argentina	X	X	X	X
Uruguay	X	X	X	X
Mexico	X	X	X	X
Venezuela	X	X	X	X

[a] For sources of data see Appendix B.

ten is the minimum. They are nontheless included because of the suggestion they give that with a large enough pool of appropriate items it would be possible to develop true scales of both of these sub-dimensions. All three of the special education items which did not fit the full scale are included in the separate special education scale. Two of the "left-over" agricultural education items, university faculty of agronomy and specialized secondary agricultural school (the latter also fits the separate secondary education scale) fit the separate agricultural education scale. Only three items fit neither the full scale nor the subscales: university faculty of education, rural primary school, and separate training institution for rural teachers. Each of these presented some interpretation problems, and their lack of fit is perhaps a result of faulty coding.[1]

To consider the meaning of these sub-scales in relation to the full scale it is necessary to return to the concept of unidimensionality as it applies to social object scaling. As originally devised for the study of attitudes, the items used for scalogram analysis are individual responses to questions which are designed to expose underlying attitudes. If a set of responses scale, it is concluded that each reflects the same underlying attitude, and only that attitude. It is assumed to be possible to devise questions which elicit responses reflecting only one attitude. With a large set of questions, it is presumably possible to sort the answers into several mutually exclusive scales, each measuring only one attitude.

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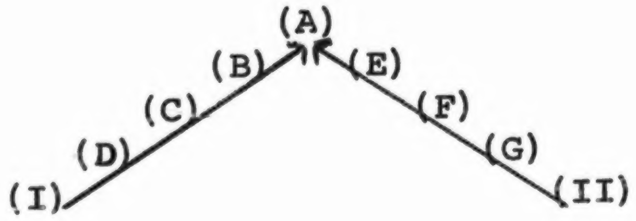
[1] For example, it proved difficult in examing some systems to determine if what are listed as rural primary schools or rural teacher training schools actually differ from those in urban areas in any respect other than location.

In social object scaling the situation is clearly different. The items of analysis are not answers to carefully phrased questions. Rather, they are already existing social entities. It is commonplace to suggest that a given unit of social structure is the resultant of many interacting forces, of many variables, and that a given unit can perform diverse tasks. When dealing with social objects, to say that a given scale measures a single variable is not to say that each "response", each item, reflects only one variable, but rather that, taken together, the whole set of items on the scale has enough common content to be thought of as measuring a single variable.

It is to be expected, then, that some items may be found in several scales.[1] For example, the item, national educational planning agency, which is part of the scale of educational structural differentiation in Latin America, is also part of a scale of Latin American national planning structure differentiation which has been developed by the author. This item is part of both the national educational system and the national planning system, it performs both educational and planning tasks, and reflects forces making for differentiation in both systems. A diagram may help clarify this point. (A) is the item which is part of



the scale of educational structural differentiation (I) and the scale of planning system structural differentiation (II). One can argue that (A) is a reflection of two variables, (I) and (II) (at least) and at the same time argue that it has enough content in common with (B), (C), and (D) to measure with them the single variable, educational structural differentiation, while having enough content in common with (E), (F), and (G) to measure with them the variable, planning system structural differentiation.

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[1] This assumes that a judgment as to the content of the item has been made and that its presence in various scales is not simply an artifact of high correlation between them. See p. 38 above.

Referring to the present case, in Tables 3 to 10, the question that the full scale answers is this: do the various sub-dimensions--secondary education differentiation, higher education differentiation, etc.--have enough content in common to be subsumable under a single dimension? Is it possible to talk about the differentiation of a total educational system, and to measure it, as a single dimension? The answer is yes, but comparison of the sub-scales with the full scale indicates that some information is lost.

Each of the four sub-scales provides a ranking of nations roughly similar to that of the full scale, but with many small and a few marked variations. For example, Panama, in the seventh rank on the full scale, is in the first rank on the higher education scale and the fourth rank on the secondary education scale. El Salvador, Bolivia, and Peru, all in the second rank on the secondary education scale, are, on the full scale, in the fourth, fifth, and sixth ranks respectively. Venezuela, in the tenth rank on the full scale, is in the first rank on the agricultural education scale and the fifth rank on the special education scale. The rank association of the full scale with the secondary education scale is .52, with the higher education scale, .87, with the special education scale, .39, and with the agricultural education scale, .55. This suggests that within the total differentiation of an educational system some variability is possible. Some systems differentiate considerably at the higher level, and less at the secondary level, others vice versa. Some differentiate considerably in the special education sector and less in the agricultural education sector, others vice versa. That the rank associations of the sub-scales with the full scale are generally high indicates that the range of this variability may be limited. That the associations are not perfect indicates that some options are available.

It is beyond the scope of this work to undertake the sort of analysis which would permit one to account fully for the contrasts between the sub-scales and the main scale.

A series of historical case studies of systems with markedly different ranks on the several scales would probably be most useful. But one of the advantages of this work may be that it lays all of the evidence out, open to examination, and exposes the patterns and contrasts which need explaining.

To determine the generalizability of the results obtained among the nineteen Latin American nations, the scale was extended to include the forty-nine nation universe specified in the previous chapter. Tables 11 and 12 report the results. The coefficient of reproducibility is .95, the coefficient of scalability is .76. When the coefficient of reproducibility is recalculated using only items with fewer than eighty percent of the responses in the modal category it reduces to .92. There is no observable non-random pattern among the scale errors.

It was possible to find data for all forty-nine nations on twenty-four of the original forty-four items. Three of these twenty-four did not fit the scale: secondary commercial school, university faculty of agronomy, and military school. The faculty of agronomy item also did not fit the full Latin

TABLE 11

SCALOGRAM OF EDUCATIONAL STRUCTURAL DIFFERENTIATION 49 NATIONS 1960[a]

C.R. = .95 C.S. = .76 C.R. using only items with -80% in modal category .92	Ministry, etc.	Teacher training inst.	Inspectorate	Curriculum agency	Secondary vocational school	Secondary industrial school	University	Pedagog. trng. secondary tchrs.	Secondary agricultural school	Pre-primary school	Special education class	Special education school	Res. inst. phys.-bio. sci.	Res. inst. social science	Res. inst. agriculture	Univ. facs. bio, chem. phys.	Res. inst. economics	Spec. secondary industrial sch.	Univ. facs. soc. or anth.
Yemen	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Nepal	X	X	X	X	O	O	X	O	O	O	O	O	O	O	O	O	O	O	O
Laos	X	X	X	X	X	O	O	O	O	X	O	O	O	O	O	O	O	O	O
Guinea	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O
Sudan	X	X	X	X	X	X	X	O	O	X	O	O	X	O	X	O	O	O	O
Tunisia	X	X	X	X	X	X	X	X	O	O	X	X	O	O	O	O	O	O	O
Saudi Arabia	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O
Cambodia	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	X	O
Burma	X	X	X	X	X	X	X	X	X	O	O	O	O	X	O	O	X	O	O
Iraq	X	X	X	X	X	X	X	X	X	O	O	O	X	O	O	O	O	O	O
Libya	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O
Afghanistan	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O
Ghana	X	X	X	X	X	X	X	X	X	X	O	O	O	O	X	O	O	O	O
Syria	X	X	X	X	X	X	X	X	X	X	*	*	O	O	O	O	O	O	O
Iran	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O	O	O	O	O
Lebanon	X	X	X	X	X	X	X	O	X	X	O	O	X	O	O	O	O	O	O
Haiti	X	X	X	X	X	X	X	X	O	X	X	X	O	O	X	O	O	O	O
Malaya	X	X	X	X	X	X	X	X	O	X	X	X	O	O	O	O	O	O	O
Morocco	X	X	X	X	X	X	X	X	O	X	X	X	O	O	O	O	O	O	O
Ceylon	X	X	X	X	X	X	X	X	X	O	X	X	O	O	O	O	O	O	O
Thailand	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O
Nicaragua	X	X	X	X	X	X	X	O	X	X	X	X	O	O	O	O	O	O	O
Paraguay	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O
Liberia	X	X	X	X	X	O	X	X	O	X	X	X	O	O	O	O	O	O	O
Jordan	X	X	X	X	X	X	O	X	X	X	X	X	O	O	O	O	O	O	O
Honduras	X	X	X	X	X	X	X	O	X	X	X	X	O	O	O	O	O	O	O

TABLE 11--Continued

C.R. = .95 C.S. = .76 C.R. using only items with -80% in modal category .92	Ministry, etc.	Teacher training inst.	Inspectorate	Curriculum agency	Secondary vocational school	Secondary industrial school	University	Pedagog. trng. secondary tchrs.	Secondary agricultural school	Pre-primary school	Special education class	Special education school	Res. inst. phys.-bio. sci.	Res. inst. social science	Res. inst. agriculture	Univ. facs. bio. chem. phys.	Res. inst. economics	Spec. secondary industrial sch.	Univ. facs. soc. or anth.
Costa Rica	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O	O	O
Ethiopia	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O
Egypt	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O
El Salvador	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O
Guatemala	X	X	X	X	X	X	X	X	X	X	X	X	O	X	O	O	O	O	O
Dominican Rep.	X	X	X	X	X	X	X	X	O	X	X	X	X	X	O	O	O	O	O
Panama	X	X	X	X	X	X	X	X	X	X	X	X	O	X	O	O	O	O	O
Bolivia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O
South Korea	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O
Phillipines	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O
Peru	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O
Pakistan	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	O	O	O
Colombia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	O	O	X
Ecuador	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O
Venezuela	X	X	X	X	X	X	X	X	X	X	O	O	X	X	X	O	X	X	O
Uruguay	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Indonesia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	O
India	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
China (Taiwan)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X
Chile	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X
Mexico	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Brazil	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Argentina	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

*ambiguous data

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[a] For sources of data see Appendix B.

TABLE 12

SCALE OF EDUCATIONAL STRUCTURAL DIFFERENTIATION 49 NATIONS 1960

Step No.	Item	Prpportion Having Item	Error
1.*	Ministry Primary school Secondary school Secondary vocational education	1.00	-
2.	Teacher training institution Inspectorate Curriculum agency	.98	0
3.	Secondary vocational school	.96	0
4.	Secondary industrial or crafts-trades school	.92	1
5.	University	.92	2
6.	Special pedagogical training for secondary teachers	.84	3
7.	Secondary agricultural school	.75	6
8.	Pre-primary school	.84	3
9.	Special education class Special education school	.65	2
10.	University research institute in physical-biological sciences	.49	7
11.	University research institute in social sciences	.41	2
12.	University research institute in agriculture	.33	6
13.	University faculties of biology, chemistry and physics	.22	1
14.	University research institute in economics	.24	4
15.	Specialized secondary industrial school	.18	2
16.	University faculties of sociology or anthropology	.14	1

* The items in Step 1 are not properly part of the scale, as they are present in all 49 nations. They are included to give a complete picture, but are not used in computing coefficients of reproducibility or scalability.

American scale. In Latin America this item did fit the small agricultural education scale. It is perhaps the case that faculties of agronomy arise more in response to pressures making for differentiation in the agricultural sector than in the educational sector. The lack of fit of the secondary commercial school item is something of a puzzle. It is present in all nineteen Latin American nations but in only sixteen of the other thirty nations.

Twelve of the nineteen Latin American nations have military schools, while only four of the remaining nations have them. Some evidence is available which may be useful in explaining the predominance of this type of school in Latin America. Using data presented by Horowitz, it is found that those nations which have military schools in Latin America have had more internal conflicts in recent years (riots, mutinies, terrorism, coups, etc.) and expend a greater proportion of their GNP on defense than those without military schools.[1] This is not surprising. But, referring to Lieuwen's typology of the penetration of the military into political life in Latin America, it turns out that of the seven nations where the military dominate political life, only two, Nicaragua and El Salvador have a military school. Of the six nations with non-political military forces, only two, Colombia and Costa Rica, do not have a military school. Among the six nations which are transitional, where the once dominant military are now only one among several politically competing groups, all have a military school.[1] It may be that in those nations where the armed forces dominate politics, they have sufficient control to reduce internal conflict while drawing their officers from the traditional educated elite, and thus seeing no need for military schools. Conversely, in those nations where the military is politically competitive (and a large number of internal conflicts might index a decrease in military control) the officer corps may be drawn from a wider, traditionally less educated, sector of the population. A need might consequently be seen for special military schools. Whatever the case, the role played by this peculiarly Latin American school is far from obvious. This is another case where scalogram analysis, arraying all of the evidence before the observer, can pinpoint questions worthy of further study.

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[1] Irving Louis Horowitz, "The Military Elites," _Elites in Latin America_, eds. Seymour M. Lipset and Aldo Solari (New York: Oxford University Press, 1967), pp. 151-56.

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[1] Edwin Lieuwen, Arms and Politics in Latin America (New York: Frederick A. Praeger, 1961).

The ranking of the items on the forty-nine nation scale is almost identical to their ranking on the Latin American scale. Only two items are reversed in position: university faculties of biology, chemistry, and physics, and university research institute in economics. Similarly, although there are a few small changes, the ranking of the Latin American nations on the forty-nine nation scale is quite similar to their ranking on the Latin American scale. The association between the two rankings of Latin American nations is .91, almost perfect. Thus, although there are small differences between the two scales, it seems reasonable to conclude that they are both tapping the same dimension.

In considering the rankings of nations along the forty-nine nation scale an additional point can be made. There is a noticeable tendency for nations from the same geographic region to "bunch up" along the scale. The nineteen Latin American nations have ranks which range from eight to sixteen; the fourteen Asian nations range from two to sixteen, and the twelve Middle Eastern nations from one to ten. The median Latin American rank is 11, and the mean rank is 12.0.

The median Asian rank is 9, the mean 9.8. The median Middle Eastern rank is 8, the mean 7.6. Table 13 summarizes these differences.

TABLE 13

SOME DIFFERENCES IN SCALE RANK BETWEEN REGIONS

	Latin America	Asia	Middle East
N	19	14	12
Range	8 - 16	2 - 16	1 - 10
Median Rank	11	9	8
Mean Rank	12	9.8	7.6

It appears that educational systems in Latin America are typically more structurally differentiated than those in Asia, while those in Asia are more differentiated than those in the Middle East.

There is, however, much overlapping, particularly between Asia and Latin America. Ruth Young has found a similar pattern, some bunching but much overlapping, in her scale of national communicability. Her comments are worth noting:

> In terms of most of the customary indicators of development, such as telephones per capita, most of the nations in each area of the world, as Latin America of Europe, are very close to each other and different from nations in other areas. This scale

> sorts the nations quite differently. . . Therefore, at the very least, this scale makes finer discriminations among nations than the traditional measures of development. However, possibly it can do more. By showing the range of variation within what is commonly recognized as a relatively uniform region, and by showing the differences among regions, these new scales can clarify the meaning of regionalism. Regional differences are not only very broad, but have long roots in history and are embedded in diffuse but influential ideologies and modes of organization. Until now it has been very difficult, therefore, to make causal inferences about the nature of these differences.[1]

For purposes of analysis, the principle advantage of a typology such as the one presented by the scale of educational structural differentiation, over a regional typology, is that the former has a single identified referent, whereas the precise referent(s) of the latter is unclear. One knows, that is, precisely in what respect nations in a given "type" are alike, why they are so classified.

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[1] Ruth Young, pp. 32-35.

CHAPTER IV

AN EVOLUTIONARY HYPOTHESIS

The scales presented in the preceding pages have been developed primarily as an exercise in measurement. But an advantage of scalogram analysis is that it provides not only a measure, a ranking of systems along the dimension being studied, but also provides a ranking of items, in this case structural elements. Thus, in addition to assessing and attempting to account for the rankings of the measured systems, which is the task of the following two chapters, one is presented with the necessity, or at least the opportunity, of accounting for the ranking of the structural elements. In the present chapter attention will be given to one of the broad substantive problems raised by the item rankings--the extent to which structural differentiation in educational systems is an evolutionary process.

The sweeping unilineal evolutionary models developed late in the nineteenth century have long been abandoned (except perhaps in Marxist circles).[1] However, the notion that there may be broad "stages" or "levels" along some dimensions through which most, if not all, societies pass has gained some popularity.[1]

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[1] It should be noted that discussions of "development" sometimes have a tendency to drift into an updated unilineal evolutionary mode. Thus one no longer speaks of the "savage" or "barbarian" societies becoming civilized; one speaks of the underdeveloped or developing societies becoming developed.

Several scholars have tried to empirically demarcate such stages. Harbison and Myers have posited four stages of human resource development, using combined secondary and higher level enrollment ratios (the latter weighted by five) as the index variable.[2] Laska has suggested three stages, with several subtypes and types of deviations, in the development of educational systems. The various stages are typified by grade IV, primary, and secondary "completion ratios"--the number actually completing the grade or level relative to the number eligible to complete it.[3] Rostow's five stages of economic development are well known.[4] Russett, using GNP per capita as an index variable, has demarcated five stages of development.[5] What these "stage" analyses typically attempt is to substitute current cross-national data, which is coming to be abundantly available for some variables, for historical data, which is more difficult (in many cases impossible) to acquire. Differences between nations at one point in time are taken to represent growth within nations over time.[1] That analogies between synchronic and diachronic data are tenuous is generally admitted. But lacking historical data for most nations on most data series, there has been little choice but to employ them.

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[1] See, for example, Parsons, and Julian H. Steward, Theory of Culture Change: The Methodology of Multilinear Evolution (Urbana: University of Illinois Press, 1963).

[2] Frederick Harbison and Charles A. Myers, Education, Manpower, and Economic Growth (New York: McGraw Hill Book Company, 1964), particularly Chapter 3.

[3] John A. Laska, "The Stages of Educational Development," Comparative Education Review, VIII (December, 1964), pp. 251-63.

[4] W. W. Rostow, The Stages of Economic Growth: A Non-Communist Manifesto (Cambridge, England: Cambridge University Press, 1963).

[5] Russett et al.

In relation to the focus of the present work, Eisenstadt has suggested that differentiation may be a staged dimension.[2] From their empirical studies of the differentiation of small communities, the Youngs have concluded that although there is no single universal sequence, there is a tendency for communities to follow roughly the same sequence in acquiring structural elements. For example, if a community "skips" an item or stage it is likely within a fairly short time to acquire it; if a community acquires an "advanced" item, it is likely fairly quickly either to abandon it or to acquire the intervening items.[1] It seems reasonable to suggest, then, that the structural differentiation of educational systems, though not a strictly unilineal process, will follow an approximately similar sequence in all societies.

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[1] Rostow's work is an exception. Rostow reasons from the historical experience of several already developed countries to the probable future experience of less developed countries. Murphy has provided a formal statement of the evolutionary hypothesis implicit within stage analysis. "Let x be any object of a domain of discourse. Then, for each and every x, x will be in social states or personal states S_1, S_2, S_3, S_4. . .S_n, in that order, and subject to the restriction that no two states be similar." George G. S. Murphy, "On Staging," Economic Development and Cultural Change, XIII (October, 1964), 70.

[2] Eisenstadt, p. 45.

Kroeber noted some time ago that the principal difference between organic evolution and cultural evolution is that the former is substitutive while the latter is additive or cumulative.[2] Guttman scales are, of course, cumulative scales, and one might therefore expect cumulative evolutionary patterns to show up as scale patterns. Winch and Freeman, discussing the arrangement of the six items on their scale of societal complexity, have advanced the hypothesis that the item ranking expressed "the sequence of development as a society increases in complexity."[3] Carneiro and Tobias, having developed a large scale of 354 cultural traits among 100 simple societies, argue more strongly for an evolutionary inference from a scale pattern. They claim that the only hypothesis which accounts for the observed regularity in a scale pattern is "that the order in which traits are arranged on a scalogram is the order in which they have been evolved."[1]

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[1] Ruth Young, personal communication. This pattern is particularly evident in an unpublished study of small Italian communities by Ruth Young and Olaf Larsen.

[2] A. L. Kroeber, Anthropology (New York: Harcourt, Brace and Company, 1948), p. 297.

[3] Winch and Freeman, American Journal of Sociology, LXII (March, 1957), 464.

However, given the Youngs' observation that differentiation tends to follow a similar sequence in small communities but is not strictly unilineal, a fairly modest hypothesis will be advanced here. It is hypothesized that the sequence of acquisition of structural elements in educational systems in Latin America has approximately, but not perfectly, followed the pattern of item ranking on the scale of educational structural differentiation for that area. If this is the case, it ought to be possible, given knowledge of the level of differentiation of an educational system at a particular point in time, to predict the structural elements (among those included on the scale of differentiation at that point in time) which the system will next acquire. Since the process of structural differentiation is not expected to be perfectly unilineal, it is hypothesized that such prediction can be made, not with perfect accuracy, but with better than fifty percent accuracy. Each of these hypotheses can be regarded as a specification for a given type of data of the broader hypothesis that structural differentiation in educational systems is an approximately evolutionary process. For convenience these two specific hypotheses will be referred to in the following paragraphs as the "sequence" hypothesis and the "prediction" hypothesis respectively.

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[1] Robert L. Carneiro and Stephen F. Tobias, "The Application of Scale Analysis to the Study of Cultural Evolution," Transactions of the New York Academy of Sciences, XXVI (1963), p. 198.

To test the sequence hypothesis an effort was made to date the acquisition of each of the scale items for each of the nineteen Latin American nations. Only those items which are actually part of the scale, which are not present everywhere in the area, were included. Such information proved extremely difficult to gather. Even when detailed histories of education in a particular country could be consulted few precise dates were found. However, of the 220 possible dates,[1] fifty-four were discovered. The results are reported in Table 14.

It can be seen that fourteen of the twenty-one actual scale items and fourteen of the nineteen nations are represented.

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[1] There are 220 "present" codings on the Latin American scale. It is not, of course, possible to date the acquisition of an item which has not yet been acquired.

TABLE 14

DATES OF ACQUISITION OF SCALE ITEMS IN LATIN AMERICA[a]

	Chile	Brazil	Argentina	Mexico	Ecuador	Venezuela	Colombia
Pedagog. trng. secondary tchrs.			1880	1935			
Special educ. school							
Ministerial advisory body		1931					
Secondary agric. school	1885	1946		1843			1941
Univ. level tchr. training inst.	1933		1874	1942		1936	1953
Research inst. phys.-bio. sci.			1936				
Research inst. soc sci.	1946		1928				1946
Univ. level school librarianship	1949	1905	1922	1945	1952	1948	1956
Educ. planning agency	1961		1961	1957	1960	1959	1957
Ministerial research division		1949					1961
Research inst. agriculture			1935				
Research inst. economics					1949		
Graduate faculty	1960						
Specialized indust. school	1858						

TABLE 14--Continued

	Panama	Uruguay	Peru	Bolivia	El Salvador	Honduras	Guatemala
Pedagog. trng. secondary tchrs.							1952
Special educ. school	1951						
Ministerial advisory body							
Secondary agric. school					1956	1951	1921
Univ. level tchr. training inst.		1951	1822	1909	1952	1956	
Research inst. phys.-bio. sci.				1946	1950		
Research inst. soc. sci.	1948						1945
Univ. level school librarianship	1941	1945	1943				1948
Educ. planning agency	1961						
Ministerial research division							
Research inst. agriculture							
Research inst. economics							
Graduate faculty							
Specialized indust. school							

[a] For sources of data see Appendix B.

Although three items, university level teacher training institution, university level school librarianship, and national educational planning agency, account for half of the fifty-four dates, the remaining twenty-seven are randomly scattered. Nation-by-nation inspection of the match between item order on the scale and order of acquisition indicates that there is a tendency for scale order to represent chronological sequence. To assess the relationship, the rank correlation between scale order and order of acquisition was calculated for each nation. The coefficients range from -1.00 to +1.00, but most are misleading because based on only two or three cases. Only four nations, Chile, Argentina, Mexico, and Colombia, have five or more items dated. The rank associations for these four nations are, respectively, .40, .43, .80, and .87, the mean rank association being .62.[1] Although the relationship is not perfect, there is among these four nations a strong tendency for scale pattern to match chronological sequence.

To include in the test data from those nations with four or fewer dated items the scale was divided into three broad stages, or levels of differentiation.[1] The first includes scale steps 1 through 5; the second stage includes steps 6 through 11; the third stage includes steps 12 through 15. If the dates are ranked within each nation, and the average rank of the dated items in each stage is computed, it is found that the mean rank in stage one is 1.9, in stage two, 2.9. The average date of acquisition of items in stage one is 1928; in stage two, 1942.[2] It appears that across the fourteen nations there is a tendency for items in stage one to be acquired before those in stage two. Although this evidence is far from conclusive, it does lend some credence to the hypothesis that the sequence of acquisition of structural elements by educational systems in Latin America has approximately followed the pattern of item ranking on the scale.

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[1] The number of items for each of these four correlations is not the same. But the numbers are so similar (7, 7, 5, and 6 respectively) that the average has some meaning.

To give further texture to the argument, and specifically to test the prediction hypothesis, a scale of educational structural differentiation in Latin America for 1950 was constructed. It is presented in Tables 15 and 16. It was considerably more difficult to gather adequate information

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[1] The lines of demarcation between these stages are rather arbitrarily drawn. They are, however, located at distinct breaks in the scale pattern.

[2] Stage three, having only four items dated, was excluded.

TABLE 15

SCALOGRAM OF EDUCATIONAL STRUCTURAL DIFFERENTIATION LATIN AMERICA 1950[a]

C.R. = .95 C.S. = .78 C.R. using only items with -80% in modal category = .92	Ministry, etc.	Pre-primary school	Secondary industrial school	Secondary commercial school	Special education class	Special education school	Secondary agriculutral school	Research inst. social science	Univ. level school librarians	Univ. level tchr. trng. inst.	Research inst. agriculture	Specialized industrial school	National apprenticeship comm.	Education planning agency, etc.
Haiti	X	O	X	O	O	O	O	O	O	O	O	O	O	O
Nicaragua	X	X	O	O	O	O	O	O	O	O	O	O	O	O
Dominican Republic	X	X	X	X	O	O	O	X	O	O	O	O	O	O
Costa Rica	X	*	X	X	X	O	O	O	O	X	X	O	O	O
Honduras	X	X	O	X	X	X	O	O	O	O	O	O	O	O
El Salvador	X	X	X	O	X	X	O	O	O	O	O	O	O	O
Paraguay	X	*	X	X	*	*	X	O	O	O	O	O	O	O
Bolivia	X	X	X	X	X	X	*	X	O	X	O	O	O	O
Ecuador	X	X	X	X	*	*	X	X	O	O	X	O	O	O
Colombia	X	X	X	X	X	X	X	X	O	O	O	O	O	O
Panama	X	X	X	O	*	*	X	X	X	O	O	O	O	O
Guatemala	X	X	X	X	X	X	X	X	X	O	O	O	O	O
Chile	X	X	X	X	X	X	X	X	X	X	O	X	O	O
Peru	X	X	X	X	X	X	X	X	X	X	X	O	O	O
Venezuela	X	X	X	X	X	X	X	O	X	X	X	O	*	O
Mexico	X	X	X	X	X	*	X	X	X	X	X	X	O	O
Uruguay	X	X	X	X	X	X	X	O	X	X	X	X	X	O
Brazil	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Argentina	X	X	X	X	X	X	*	X	X	X	X	X	X	O

*ambiguous data

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[a] For sources of data see Appendix B.

TABLE 16

SCALE OF EDUCATIONAL STRUCTURAL DIFFERENTIATION
LATIN AMERICA 1950

Step No.	Item	Proportion Having Item	Error
1.*	Ministry	1.00	-
	University		
	Teacher training institution		
	Inspectorate		
	Curriculum agency		
	Primary school		
	Secondary school		
	Secondary vocational education		
	Secondary vocational school		
2.	Pre-primary school	.89	0
3.	Secondary industrial or crafts-trades school	.89	1
	Secondary commercial school	.79	2
4.	Special education class	.81	0
5.	Special education school	.73	0
6.	Secondary agricultural school	.65	0
7.	University research institute in social sciences	.58	3
8.	University level school of librarianship	.47	0
9.	University level teacher training institution	.47	2
10.	University research institute in agriculture	.42	2
11.	Specialized secondary industrial school	.26	1
12.	National apprenticeship commission	.17	0
13.*	National educational planning agency	.00	-
	University faculties of Biology, Chemistry and Physics		
	University faculties of Sociology or Anthropology		

*The items in Steps 1 and 13 are not properly part of the scale as they are present, respectively, everywhere and nowhere among the 19 nations. They are included to give a complete picture, but are not used in computing coefficients of reproducibility or scalability.

for this earlier date, and the 1950 scale is consequently less elaborate than the 1960 scale. Only twelve items are properly part of it, being present in some but not all of the nations. Among those items common to both the 1950 and 1960 scales the ranking is almost identical. University level teacher training institutions rank higher in 1960 than in 1950. In 1950 this item ranks below university research institute in social sciences and university level school of librarianship; in 1960 it ranks above them. For whatever reason such teacher training institutions proliferated more rapidly than the other two items during the ten year period.

The rankings of nations on the two scales are roughly similar--rank association = .61--but there are some notable shifts in position. For example, in 1950 Guatemala is on the eighth of twelve scale steps, while in 1960 it has one of the three least differentiated systems. Similarly, Uruguay, with one of the three most differentiated systems in 1950, is by 1960 in the tenth of fifteen steps. Conversely, Ecuador and Chile made fairly substantial relative improvements in their scale rank over the ten year period. Although nations tend to maintain roughly the same position relative to their neighbors, it is possible, even within a short period of time, for some to advance much more rapidly, and for others to stagnate.

What it is that accounts for the relative advancement or decline of particular systems in unclear. An attempt was made by the author to construct some sort of index or measure of relative advancement or decline, but the work foundered on the problem of how to treat nations with differing original positions. To illustrate, the system with the very lowest rank in 1950, Haiti, had nowhere to go but up; it could not possibly have declined. Systems with ranks near to the lowest could have declined in rank very little. Should an increase of, say, three ranks by such low ranking systems be treated as equivalent to the same increase by a system which was in the middle of the rankings in 1950? Intuitively it does not seem reasonable. Looking at the problem the other way round, systems with very high scale positions in 1950 (e.g. Mexico, Uruguay, Brazil, Argentina) had little or no possibility of increasing their rank. They could only maintain their position or decline in rank. Should a decline of three ranks by such a high ranking system be treated as equivalent to a decline of three ranks by a system in the middle of the 1950 rankings? Again, it hardly seems appropriate to treat the decreases as equivalent. And what, then, does one do with systems which have maintained their rank over the ten year period. It seems a bit odd, to say the least, to treat Haiti, which ranks lowest on both the 1950 and 1960 scales, as equivalent to Brazil, which occupies the highest rank on both scales.

Perhaps the only way to handle such data is to consider only those systems which in 1950 had the same rank. Thus, one would compare Honduras, which maintained its rank from 1950 to 1960, with El Salvador, which started with the same rank as Honduras, but was 2.5 ranks higher in 1960. Or one would compare Bolivia, which maintained its position, with Ecuador and Colombia, which started from the same scale position as Bolivia, but made substantial relative gains. One could then determine whether those systems which gained or declined relative to their neighbors differed in any systematic fashion from each other and from those systems which maintained their position.

Just such an approach was attempted, using those educational and non-educational data series which are available for 1950 (these series are presented in the following chapters). Nothing came of it. There are no apparent consistent differences between nations which gained, those which declined, and those which maintained their scale position, when they are compared according to 1950 scale position. It is certainly not suggested that there are no differences, that the advancement or decline of a system, relative to other systems, is uncaused. However, the analytic techniques and data available for this study have not permitted the discovery of these differences.

To illustrate more clearly the changes which occurred from 1950 to 1960, Table 17 presents the 1950 scale with changes in codings at 1960 superimposed. The underlined X's adjacent to the 1950 codings, indicate items present in 1960 which were absent in 1950 (or uncoded due to data ambiguities). The underlined O's denote items present in 1950 but absent in 1960. There are only three cases of the latter type of change: the two special education items in

TABLE 17

SCALOGRAM OF EDUCATIONAL STRUCTIONAL DIFFERENTIATION LATIN AMERICA 1950 WITH CHANGES BY 1960

C.R. = .95 C.S. = .78 C.R. using only items with -80% in modal category = .92	Ministry, etc.	Pre-primary school	Secondary industrial school	Secondary commercial school	Special education class	Special education school	Secondary agricultural school	Research inst. social science	Univ. level school librarians	Univ. level tchr. trng. inst.	Research inst. agriculture	Specialized industrial school	National apprenticeship comm.	Education planning agency, etc.
Haiti	X	OX̲	X	OX̲	OX̲	OX̲	O	O	O	O	O	O	O	O
Nicaragua	X	X	OX̲	OX̲	OX̲	OX̲	OX̲	O	O	O	O	O	O	O
Dominican Republic	X	X	X	X	OX̲	OX̲	O	X	O	OX̲	O	O	O	O
Costa Rica	X	*X̲	X	X	X	OX̲	OX̲	O	O	X	X	O	O	O
Honduras	X	X	OX̲	X	X	X	OX̲	O	O	OX̲	O	O	O	O
El Salvador	X	X	X	OX̲	X	X	OX̲	O	O	OX̲	O	O	O	O
Paraguay	X	*X̲	X	X	*X̲	*X̲	X	O	O	OX̲	O	O	O	O
Bolivia	X	X	X	X	X	X	*X̲	X	O	X	O	O	O	O
Ecuador	X	X	X	X	*X̲	*X̲	X	X	OX̲	O	X	O	O	O
Colombia	X	X	X	X	X	X	X	X	OX̲	OX̲	O	O	OX̲	O
Panama	X	X	X	OX̲	*X̲	*X̲	X	X	X	OX̲	O	OX̲	O	O
Guatemala	X	X	X	X	X	X	X	X	X	O	O	O	O	O
Chile	X	X	X	X	X	X	X	X	X	X	OX̲	X	OX̲	O
Peru	X	X	X	X	X	X	X	X	X	X	X	O	OX̲	O
Venezuela	X	X	X	X	XO̲	XO̲	X	OX̲	X	X	X	OX̲	*X̲	O
Mexico	X	X	X	X	X	*X̲	X	X	X	X	X	X	OX̲	O
Uruguay	X	X	X	X	X	X	X	OX̲	X	X	X	XO̲	X	O
Brazil	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Argentina	X	X	X	X	X	X	*X̲	X	X	X	X	X	X	O

*ambiguous data

Venezuela and the specialized industrial school item in Uruguay. The other thirty-four changes represent new items added during the decade.[1] Of these thirty-four changes, five are present codings in skipped item error locations on the 1950 scale (e.g. secondary industrial school in Honduras). Twenty-three are new present codings joined to the 1950 pattern with no intervening absent codings. Two are joined to the 1950 pattern with only one intervening absent coding. Only four of these new present codings are separated from the 1950 pattern by two or more absent codings. Eighty-eight percent of the new present codings are either in skipped item error locations, joined to the 1950 pattern with no break, or joined with only one intervening absent coding.

It was predicted after completion of the 1950 scale, and before systematically comparing it to the 1960 scale, that by 1960 each nation would have acquired the item adjacent to the end of its scale pattern in 1950, and that all skipped item errors would have been picked up. Of the sixteen possible predictions as to adjacent item acquisition (no prediction was possible for Uruguay, Brazil or Argentina, as they had complete patterns in 1950) twelve were successful. All five of the skipped item errors in 1950 were made up by 1960. Thus it proved possible on the basis of 1950 scale pattern, to predict with eighty-one percent accuracy--seventeen out of twenty-one. Even had the original prediction been broader, had it included acquisition of the next two rather than the next one item on the scale, it would have been successful in twenty-four of thirty-six possible cases--sixty-six percent accuracy. The hypothesis that it is possible, given knowlecge of the level of differentiation of an educational system at a particular point in time, to predict the structural elements the system will next acquire, with better than fifty percent accuracy, is substantially supported by this evidence.

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[1] Those cases where a coding was ambiguous in 1950 but an item was present in 1960 are disregarded here. It is not clear whether these represent change.

It seems reasonable to conclude that there is a general tendency for educational structural elements to be acquired by nations in the same order. Moreover, this roughly universal sequence appears to be approximated by the scale order of items. Relatively accurate prediction is consequently possible. However, the process is not unilineal. Nations may occasionally acquire a very "advanced" (for their then current level of differentiation) item and maintain it for some time without acquiring all the intervening items. The agricultural research institute in Costa Rica is an example of this. Nations may also skip certain items. There is, however, a striking tendency for such skipped items to be acquired in fairly short order.[1] Also, although the evidence presented here does not demonstrate this, it is possible for nations to acquire several items almost simultaneously. This pattern of acquisition might be expected to be particularly common among some of the newly independent nations which have been excluded from this analysis.

Some additional limitations upon the predictability of differentiation from scale patterns should be stressed. It is obviously not possible to predict, from a scale, the incidence of items not included on that scale. One could not have predicted from the 1950 Latin American scale, for example, anything about the incidence of ministerial advisory bodies in 1960. This is in a sense a technical limitation.

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[1] It will be recalled that similar patterns of item acquisition have been observed in empirical studies of small community differentiation.

If scales are made more elaborate, i.e. if more items are included, this limitation will become less relevant.

Equally obviously, it is not possible to predict the occurrence of items not now in existence. For example, suppose a new universal language, "polyglot," is invented in the near future. At present no university has a department of "polyglot." But the new language might be easier to learn and much cheaper to teach, than science or sociology, and mastery of it by the elite might be viewed as very important to development. Thus, while university faculties of "polyglot" would not be found on a scale of educational structural differentiation today, in a few years such an item might rank well ahead of faculties of science or sociology. Many nations might have faculties of "polyglot" while relatively few had yet developed the other faculties.[1] Referring to the scales presented here, it would have been impossible to predict, from knowledge intrinsic to the 1950 scale, the establishment, starting late in the 1950s, of a number of national educational planning agencies.

Even considering only those items included on a scale representing a particular point in time, it is not possible to predict, from knowledge intrinsic to the scale, changes in technology or other social conditions which may affect the incidence of items. For example, a scale of U. S. community differentiation in 1910 would have had blacksmith shops as a very common item, while gas stations would have been rare. Today the position of the two items would be reversed. (Indeed, blacksmith shops would probably be a high error item, as they are found today only in rather large cities and in small rural backwaters). The importance of this limitation most likely increases with increase in the time span of predictions. That is, social and technological changes may not have a great effect on ten-year predictions--witness the high degree of success in predicting from 1950 to 1960--whereas they might have much greater effect on thirty or forty year predictions.

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[1] This example was suggested by Ruth Young.

It must finally be stressed that any conclusions drawn in this chapter are tentative. The evidence is far from complete. It would be most interesting to see if the rather high association between scale order of items and the sequence of their acquisition continues to hold as more items are dated. It would also be most interesting, when adequate post-1960 data become available, to evaluate predictions as to item acquisition made from the 1960 scale, as was done with the 1950 scale. It may be of significance to note that in 1962 Brazil established a national educational planning agency, thus removing the one skipped item error in its 1960 scale pattern.[1] Also, by 1964 Venezuela had established university departments of Biology, Chemistry and Physics, a ministerial audio-visual division, and special education classes and schools. These are precisely the four items it "should have" next acquired, according to the 1960 scale.[2]

To conclude that structural differentiation of educational systems is in a general way evolutionary, and that the typical order of item acquisition is approximated by the scale pattern, is only to begin the job of accounting for the ordering of structural items. One must next ask two extraordinarily difficult questions. Why are these items typically acquired in this order? What accounts for this similarity in what are otherwise quite diverse nations? To provide anything like adequate answers to these questions will require much additional work. Historical studies of the development of particular educational systems, trying to discover the series of events leading to the establishment of each structural element, would perhaps be most useful.[1] Some tentative and partial explanations have, however, been suggested.

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[1] Rafael Fernandez H., Situacion del planeamiento integral de la educacion en America Latina, Union Panamericana (Washington, D. C.: 1963).

[2] Edward Nemeth, Syracuse University, personal communication, 1968.

Lindsey Churchill has advanced a "cheapness" explanation, suggesting that those items which are found almost everywhere are so general because they require neither a great deal of effort nor much money. Thus, even a university can consist of nothing more than "four teachers and twelve students in a condemned building."[2] This argument is doubtless true to some extent. It likely does take less money to establish a rudimentary ministry than to establish faculties of Biology, Chemistry and Physics. Such an explanation is not very useful, however, in accounting for the finer discriminations made by the scales. Are, for example, social science research institutes cheaper than research institutes in agriculture? Is it cheaper to have a national planning agency than a ministerial audio-visual division? The answer is that it may or may not be. This leads to the major difficulty with the cheapness explanation. Practically every scale item can be either cheap or expensive. An educational research institute, the least common item in Latin America in 1960, can be nothing more than four professors with no students in two rooms of that condemned building noted above. This explanation may be useful in some cases for some items, but it leaves much to be accounted for.

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[1] It would be quite instructive, for example, to determine the extent to which the patterning of differentiation between 1950 and 1960 in Latin America was a consequence of the activities of the OAS or Unesco, or of the pressures accompanying U. S. aid programs.

[2] Lindsey Churchill, Russell Sage Foundation, personal letter, 1965.

Another explanation suggests that earlier items are in some sense prerequisites for later items.[1] This explanation also holds to some extent. A nation without a ministry is not likely to have a ministerial audio-visual division. Nations are hardly likely to establish programs for the pedagogical training of secondary teachers if they do not already have secondary schools. But it is again of little help in attempting to deal with the finer discriminations. It would be difficult, for example, to argue that a ministerial research division is a prerequisite for either a ministerial audio-visual division or a research institute in education.

Another partial explanation might follow the style of analysis proposed by the economist Hirschman.[2] Hirschman speaks of the deliberate creation of economic disequilibria and discontinuities as inducements to change. For example, standard doctrine might suggest that consumer markets be established only after the production of consumer goods is fairly well underway and/or the basic transportation net which permits the distribution of such goods has been established. Hirschman suggests rather than if consumer markets are established earlier they will have a sort of "backlash" effect, creating demands which will lead to the establishment of production and transportation facilities.

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[1] Marsh, Comparative Sociology, p. 308.

[2] Albert O. Hirschman, The Strategy of Economic Development (New Haven: Yale University Press, 1958).

This type of reasoning might prove useful in accounting for the marked tendency for skipped item errors to be picked up. That is, one could say that advanced items tend to exert a sort of back pressure, creating demands for the items which have been skipped. For example, establishment of a national apprenticeship commission might lead to an awareness of a need to establish any of the specialized secondary vocational schools which had been skipped. Similarly, the establishment of university faculties in science or sociology-anthropology might lead to the establishment of research institutes in the in the physical and social sciences if these were not yet present. It is not, however, clear how such a line of reasoning would account for most of the data shown in Table 17.

Honduras, for example, was missing a secondary industrial school in 1950 but acquired it during the following ten years. It is hard to see what sort of back pressure might be produced by a commercial school or by a special education class and school, which would lead to a demand for an industrial school. El Salvador and Panama were both missing a secondary commercial school in 1950. How the five items which follow commercial school on the scale might have created demands leading to the establishment of commercial schools in both nations by 1960 is not very clear. In looking over Table 17, there is only one case where a possible connection between the early acquisition of an "advanced" item and the later acquisition of an intervening item can be seen. In Costa Rice, it is at least conceivable that the research institute in agriculture which was present in 1950 provided a channel or focus for communicating to the political system those demands which led to the establishment of an agricultural school. However, the establishment of secondary agricultural schools in that nation was part of an effort begun by the Ministry of Education in 1956 to systematize and rationalize all vocational education efforts in the country.[1] Thus, although the existence of an agricultural research institute may have had something to do with the creation of secondary agricultural schools, their establishment can better be viewed as part of the system-wide effort in the vocational education area. This type of explanation must also be considered as generally inadequate for the data presented here.

Perhaps the major lesson to be drawn from the consideration of these suggested explanations is that to account thoroughly for the pattern of differentiation exposed by the scales will be an extremely complex task--albeit one which now can be, and perhaps ought to be, undertaken.

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[1] Unesco, World Survey of Education, III, Secondary Education (Paris: 1961), pp. 388-89 and Arnoldo Escobar and Victor M. Ardon, La educacion agropecuria en Centro America Instituto de Investigaciones y Majoramiento Educativo, Estudios de la Educacion Media en Centro America (Ciudad Universitaria, Guatemala: 1964).

CHAPTER V

SOME INTRA-SYSTEM RELATIONSHIPS

In this and the following chapter attention is shifted from differentiation as a process to differentiation as a state. By examining the patterns of association between educational structural differentiation and a number of other variables some idea of its sources and consequences may be acquired. In this chapter relationships within the educational system will be considered. In Chapter VI some boundary-crossing relationships will be examined.

It is, of course, assumed that the various dimensions of a system are interrelated. That is, change along any one dimension can be expected to be accompanied by or produce change along other system dimensions. The problem is to discover the educational variables with which structural differentiation is closely associated and those with which it has a weak relationship.

A Limitation: The Available Data

Consideration of those educational system dimensions for which measures can be constructed, given the available data, will help to make explicit the limits of this exercise. In Chapter I, where structural differentiation was defined, it was distinguished from another dimension of system structure, segmentation. Segmentation is the ramification or proliferation of a particular type of structural element. As a state, it refers to the number of a given type of structural element present in a system at a particular point in time. Data are available concerning the number of primary and secondary schools in Latin American nations for 1950 and 1960. These have been used to construct measures of primary and secondary segmentation at those two points in time. That is, systems are ranked according to the number of schools they had at each level. Because there is no evidence that segmentation of educational systems in toto is unidimensional, the variable has been measured separately at the two system levels. Indeed, given the variety of types of schools which may be found at the secondary or higher levels, it is not clear that either of these two data series themselves provide a unidimensional measure. It might be more appropriate to consider, say, secondary commercial schools, secondary agricultural schools, secondary university preparatory schools, separately. However, these crude aggregated data series are all that are available cross-nationally, and they will permit at least some consideration of segmentation.

System population can be assessed using enrollment data. Such data are available both in terms of total enrollment and enrollment as a ratio to total eligible population. Enrollment figures are here considered separately by level--primary, secondary, and higher--as there is in this case also no evidence that the total enrollment of an educational system is a unidimensional variable. There are available, in addition, a variety of data series having to do with money invested in the educational system, teachers in the system, and number or proportion of students studying abroad.

It is particularly unfortunate that there is available no measure of system organization. This dimension, relating as it does to the nature and direction of the communicative links between structural elements, appears to be of considerable importance to an understanding of how systems respond and adapt. Just how the organization of a whole system might be measured is not clear, although mathematical net theory has some promise of being useful.[1] Whatever the case, lacking such a measure the analysis here is concerned with the relationships among structural differentiation, segmentation, enrollment, enrollment ratios, and a few other data series. What patterns of relationship might one then expect among these variables for which measures are available?

Structural Differentiation, Segmentation, and Enrollment: Some Probable Relationships

There appears to be an obvious connection between enrollment and segmentation. Increased segmentation can be expected to produce capacity for the system to absorb more

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[1] See, for example, T.J. Fararo and Morris H. Sunshine, A Study of a Biased Friendship Net (Syracuse: Syracuse University Youth Development Center, 1964).

students, to increase its population. This is of course the usual reason for building schools--to accommodate more students. Structural differentiation may have a similar effect on enrollment, although the relationship is less direct and less immediately obvious. Establishing new types of schools can permit the accommodation of new types of students who may otherwise have left, or never have entered, the system. There is no particularly apparent direct connection between segmentation and structural differentiation.

Mott, in attempting to systematize the available evidence concerning sources of variation among social organizations, has considered segmentation and structural differentiation as consequences of population increase. He has advanced the following proposition: "As the population of a social organization increases, the number of its parts and the degree of their specialization also increases."[1] It will be noted that Mott is speaking of both segmentation ("the number of its parts") and structural differentiation ("the degree of their specialization") as consequences of population increase. However, an important qualification is added.

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[1] Paul E. Mott, The Organization of Society (Englewood Cliffs: Prentice Hall, 1965), p. 50.

> An organization can accommodate itself to an increase in size by creating additional but wholly similar units so long as those units remain fairly independent of each other. In other words, *differentiation among the parts need not occur if there is a minimum of interaction among them*.[1]

Using the terminology adopted here, and taking the qualification into account, Mott's original proposition can be rephrased as two propositions: 1) As the population of a social system increases, there will be an increase in segmentation; 2) As the population of a social system increases, there will be an increase in structural differentiation if there are strong communicative links between system elements.

What do these propositions mean in relation to an educational system? As more students enter a system, pressure will be created to build more schools. This is hardly startling and is as obvious as its converse, that building more schools allows a system to accommodate more students. The substantive meaning of the second part of Mott's proposition (as rephrased) is less obvious. A system can respond to increasing enrollment simply by building more primary schools, secondary schools, normal schools, etc., of the same type, so long as these remain fairly independent of one another. This has, of course, been the typical response of developing systems. They have simply built more and more schools, usually concentrating on the primary level. But if the newly created schools are linked in fully with the rest of the system, coordination becomes necessary. If, for example, pupils and teachers can transfer from one to another primary school or secondary school, some means of keeping the process orderly will have to be developed. This is likely to take the form of a variety of administrative specialists who attempt to assure some (at least) minimal level of uniformity across schools of the same type. Eventually one would expect the development of separate ministerial departments or agencies to take care of these coordinative tasks.

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[1] *Ibid*., p. 51.

As another example, if a large number of newly created primary schools are to be linked with the secondary level by allowing some students from the new primary schools access to the secondary level, there will likely be pressure to create new types of secondary schools to accommodate the wider range of interests and abilities included in a larger group of students. It should be noted that this pressure may not come from the new students. Indeed, they may be most interested in having new schools of the traditional prestigous university-preparatory type built.[1] Moreover, up to a point such differentiation need not be the result. The policy which is typically followed at the primary level--simply building new schools which are identical to the old schools[2]--can certainly be followed at the secondary level for a while. But at some point the range of ability will become sufficiently wide as to set up a demand for new types of schools. Many systems have of course recognized this by carefully controlling the flow from primary to secondary according to level of measured ability.[1]

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[1] Certainly, one of the serious problems faced by many developing educational systems is that of keeping the non-academic secondary schools from being turned by the students into second-rate academic secondary schools.

[2] It should be noted that even at the primary level, a great expansion in enrollment is likely to lead to some differentiation to accommodate different types of children. Thus, one finds a variety of special types of rural schools in Latin America. For a variety of examples, see, Union Panamericana, Propuesto para un Programa Conjunto sobre Educacion Agricola entre el Instituto Interamericana de Ciencias Agricolas y la Secretaria General de la OEA, Anexo B, Descripcion Breve de la Ensenanza Agropecuaria en 6 Paises Latinoamericanos (Washington: 1963).

In considering the effect of enrollment increase on segmentation and structural differentiation several caveats should be noted. There are a variety of possibly intervening variables whose effect has not been considered. For example, such matters as actual or desired pupil-teacher ration, number of classrooms per school, length of the school year, whether there are single or double sessions, all can affect the nature or extent of the structural consequences of enrollment increase. Also, it is not assumed that increased enrollment is the only, or even necessarily the most important, producer of demands for increased structural differentiation. The most important demands may well be generated outside of the system. Moreover, the response to change along any system dimension can be expected to lag over an undetermined and variable period of time.

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[1] An interesting example of the relationship between population and differentiation can be seen in the U.S. As the link between secondary and higher education has widened, there has been created an extraordinary variety of schools and programs at the post-secondary level to accommodate the increasingly wide range of interests and abilities.

The examples given, however, should indicate that Mott's proposition as rephrased is at least reasonable when applied to educational systems. The important question is not how reasonable a proposition seems, but how accurate it is. Before considering that question, before examining the available data from Latin America to see what the relationships between these dimensions actually are, a technical problem which limits the way in which these relationships can be assessed will be discussed.

Another Limitation: A Measurement Problem

The preceding discussion has been phrased in terms of changes along the dimensions (e.g., increase in population will result in increased segmentation or structural differentiation). Ideally, then, one should use time series data--amount of change or rate of change--for measuring the dimensions. There are, however, several methods for computing time series, each of which gives different results (i.e., different nations will be ranked high and low depending upon the method uses). The first method is to measure absolute increase. This method tends to favor the large, more populous, systems located in larger, more populous, nations. For example, during the period 1950 to 1960 Brazil increased its secondary level enrollment by 638,144 pupils, while increasing its secondary enrollment ratio from .11 to .12. Costa Rica, on the other hand, increased its secondary enrollment ratio from .11 to .28 while adding only 27,332 students.

The most common solution to this problem is to divide the absolute increase by the starting score, thus getting a percentage increase figure. This method, however, introduces the opposite bias to that introduced by the absolute increase method. That is, it is much easier to achieve a high percentage increase if the starting score is very low. For example, Chile in 1950 had 145,800 secondary students enrolled, and a secondary enrollment ratio of .24. By 1960, while changing its enrollment ratio to a negligible extent, Chile had 230,482 secondary students enrolled, representing an increase of 52.69 percent. Meanwhile, El Salvador, starting with 7,700 secondary students enrolled, and an enrollment ratio of .06, added only 25,903 students. This was however sufficient to produce an increase of 232.73 percent.[1]

McClelland has suggested a quite different technique to remove the bias from absolute increase figures. The regression line between initial level and absolute gain is computed and this line is used to indicate the predicted gain for each starting score. By comparing the predicted with the actual gain, the degree of over- or under-achievement for each country, in standard deviations from the regression line, can be determined.[2] Unfortunately, for the type of variables considered here the variations around a regression line typically form a conical pattern, with the large end of the cone representing the variations of the systems with high initial scores. Consequently, systems with low starting scores can be moderate over- or under-achievers, but only systems with high initial scores can be big successes or failures.[1]

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[1] Enrollment data and enrollment ratio data from Ismael Rodriguez Bou, La Educacion Superior en America Latina, Union Panamericana, Subsecretaria para Asuntos Culturales, Cientificos y de Informacion (Washington: 1963), Table Number 7, p. 56 and Table Number 18, p. 73.

[2] David C. McClelland, The Achieving Society (Princeton: D. Van Nostrand Company, Inc., 1961), pp.87-89.

Thus, whatever method of scoring is used, some bias is introduced, which confounds the interpretation of any correlations which might be calculated using time series. Consequently such data series will not be used here. Rather, levels of segmentation and enrollment[2] at two points in time, 1950 and 1960[3] will be used, in conjunction with the 1950 and 1960 scales of educational structural differentiation.

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[1] The discussion of the relative merits of these different scoring techniques is partially adapted from Adams and Farrell, Chapter 8, pp. 24-25. For a much more detailed consideration of the problems involved in the use of time series data, see Chapter 8, pp. 23-31, of that volume.

[2] Actual enrollment figures rather than enrollment ratios are used. An enrollment ratio takes enrollment in some part or level of the system as a proportion of those eligible to be in that part or level. In considering intra-system relationships one is concerned with the number of students in the system,regardless of the number or proportion of their age-mates who are not in the system.

[3] The later segmentation data refer to 1961. For convenience they will be called 1960 data.

Structural Differentiation, Segmentation, and Enrollment: The Actual Relationships

Before examining the coefficients of association among structural differentiation, segmentation, and enrollment, it may be helpful to summarize the expectations concerning these relationships, which are derived from the preceding sections. At any point in time, segmentation and enrollment should be quite highly associated. Structural differentiation and enrollment, at any point in time, should be rather moderately associated, certainly at a lower level than segmentation and enrollment. Enrollment in 1950 should predict segmentation in 1960 at a higher level than it predicts 1960 structural differentiation. Segmentation in 1950 should predict enrollment in 1960 at a higher level than does structural differentiation in 1950. There is no clear suggestion as to what the remaining patterns of association are. Tables 18 - 20 present the rank association coefficients calculated to assess these relationships.

TABLE 18

RANK ASSOCIATION OF ENROLLMENT WITH SEGMENTATION BY LEVEL: LATIN AMERICA[a]

Enrollment	Segmentation			
	Primary 1950	Secondary 1950	Primary 1960	Secondary 1960
Primary 1950	.78		.68	
Secondary 1950		.74		.78
Primary 1960	.83		.76	
Secondary 1960		.75		.75

[a] Enrollment data: Ismael Rodriquez Bou, La Educacion Superior en America Latina, Union Panamericana (Washington: 1963), Table 6, p. 55, Table 7, p. 56 and Table 8, p. 58. Segmentation data: Unesco, World Survey of Education, II, Primary Education, III, Secondary Education, IV, Higher Education (Paris: 1957, 1961, 1965).

Table 19

RANK ASSOCIATION OF ENROLLMENT BY LEVEL, WITH EDUCATIONAL STRUCTURAL DIFFERENTIATION: LATIN AMERICA[a]

Enrollment	1950 Structural Differentiation	1960 Structural Differentiation
Primary 1950	.66	.58
Secondary 1950	.76	.71
Higher 1950	.76	.54
Primary 1960	.60	.57
Secondary 1960	.69	.79
Higher 1960	.80	.65

[a] Enrollment data: see Table 18.

Table 20

RANK ASSOCIATION OF SEGMENTATION BY LEVEL, WITH EDUCATIONAL STRUCTURAL DIFFERENTIATION: LATIN AMERICA[a]

Segmentation	1950 Structural Differentiation	1960 Structural Differentiation
Primary 1950	.58	.52
Secondary 1950	.71	.63
Primary 1960	.50	.48
Secondary 1960	.67	.59

[a] Segmentation data: see Table 18.

Looking first at the relationships between these variables at a given point in time, it is clear, from Table 18, that enrollment and segmentation are highly associated. The coefficients are .78 and .74 in 1950 and .76 and .75 in 1960. For the Tau statistic these are quite high. Turning to Table 19 the association of enrollment with structural differentiation is almost identical in level to the association between enrollment and segmentation, except at the primary level. The slightly lower association at the primary level probably reflects the fact that there is very little structural differentiation which takes place at that level.

Looking at the relationships shown in Tables 18 and 19 over time, enrollment in 1950 does predict 1960 segmentation (Tau = .68 and .78) at a slightly higher level than it predicts 1960 structural differentiation (Tau = .58, .71, and .54). Likewise, 1950 segmentation predicts 1960 enrollment (Tau = .83 and .75) at a slightly higher level than does 1950 structural differentiation (Tau = .60, .69 and .80). However, the differences are not large and even the lowest of the coefficients (.54) is, for Tau, rather high. Thus, at any one point in time, systems with high levels of enrollment are likely to rank high both on segmentation and structural differentiation. Over time, segmentation is slightly more closely associated with enrollment than is structural differentiation, but the association between enrollment and structural differentiation is nontheless high. Referring to Mott's original argument, it appears that in Latin American educational systems the intervening variable organization may be operating so as to permit increases in enrollment to be reflected in increased structural differentiation.

Given the relationships just noted, those reported in Table 20 are not surprising. That is, if systems with relatively high enrollment rank high on measures of both segmentation and structural differentiation, one would expect the latter two to be themselves rather highly associated, although not necessarily at so high a level as either is associated with enrollment.

Looking at the three tables together, it is possible to determine for each pair of the dimensions, which best predicts which, over time. Structural differentiation in 1950 predicts 1960 enrollment slightly better than 1950 enrollment predicts 1960 structural differentiation. Segmentation in 1950 predicts 1960 enrollment slightly better than 1950 enrollment predicts 1960 segmentation. In both of these cases the differences are not large. The relationships are almost as stong in one direction as in the other. Segmentation in 1950 predicts 1960 structural differentiation at almost exactly the same level as 1950 structural differentiation predicts 1960 segmentation.

A simple model can be constructed which summarizes these relationships. It is shown in Figure 1.

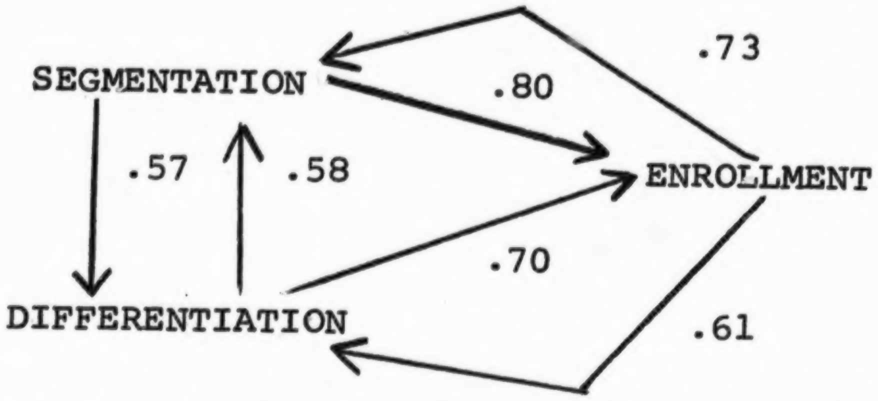

Fig. 1. A model of associations within educational systems over time: Latin America.

The numbers adjacent to the directional arrows indicate the mean association between the source dimension in 1950 and the target dimension in 1960. For example, the mean rank association between segmentation in 1950 and enrollment in 1960 is .80. The mean rank association between enrollment in 1950 and segmentation in 1960 is .73. It should be emphasized that the relationships between all of these dimensions are high, and the differences are small. Consequently, there are other models which would portray the patterns of association among the three dimensions over time almost as well as Figure 1.

This model suggests that the style of analysis pursued by Mott may not be entirely (or at least exclusively) germane to the study of educational systems. Mott has argued from population change to its effect upon structure. The evidence presented here suggests that the strongest influence runs quite the other way, at least in Latin American educational systems. Enrollment is more predicted by than a predictor of both structural dimensions. Even if the differences in predictive strength shown in Figure 1 are interpreted very conservatively--if it is maintained that .80 and .73 are for all practical purposes identical, and that .70 and .61 are the same--it is still clear that enrollment is as much predicted by as a predictor of the structural dimensions. This, in conjunction with the fact that both structural dimensions are closely associated with enrollment, may suggest that if it is wished to increase the enrollment of a system it would be wise to pay some attention not only to segmentation, to the number of new schools to be built (which is where ministries of education tend to focus their attention) but also to the type of schools to be built, to the differentiation of the system's structure.

This might seem rather simple and obvious, but it should be noted that it flies in the face of some rather widely circulated opinion. For example, Harbison and Myers, in what is certainly one of the most widely read studies of education and development, suggest that the highest priority for "partially developed countries," in which category most Latin American nations are found, should be given to an expansion of enrollment at the secondary level. They suggest that this should be done by increasing the number of general secondary schools, and argue vigorously against establishment of a variety of specialized vocational schools.[1]

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[1] Harbison and Myers, pp. 95-96. In fairness it must be noted that the "prescription" for "semi-advanced" countries, in which category Mexico, Costa Rica, Venezuela, Chile and Uruguay are found, includes as its top priority items "emphasis on scientific and technical faculties (including agriculture)," at the university level, expansion of post-graduate training, and the establishment of research institutes in science and technical fields. All of these areas are tapped by items used in this study.

It is not being suggested here that enrollment and segmentation should be overlooked. Both dimensions are of obvious importance to educational system development. It is simply suggested that there is at least one other dimension, educational structural differentiation, which is closely associated with enrollment and segmentation, and which has not been given very careful attention before this.

In response to the argument just made, it might be suggested that there is no causal connection at all between structural differentiation and enrollment, but that their high association traces to the fact that high enrollments and highly differentiated educational systems are found in large nations. The four nations with the most differentiated educational systems, Chile, Brazil, Mexico, and Argentina, are all very large and populous relative to their neighbors, and could therefore be expected to have high enrollments, quite apart from their level of structural differentiation. Several pieces of evidence can be marshalled against this apparently plausible point. In the first place, the association between enrollment and population is not perfect. As one would expect, it is quite high at the primary level (Tau = .82 in 1960) but less so at the secondary and higher levels (.60 and .62 respectively in 1960). Structural differentiation is itself related to population at a still lower level (.48). Thus, the most populous nations are very likely to have the most children in primary schools but are not quite so likely to have the greatest number of students in secondary or higher level schools, and are even less likely to have the most differentiated educational systems. However, even the lowest of these coefficients (.48) is moderately high for Tau.

Table 21 shows the effect upon relationships between enrollment and differentiation when population is held constant. As one would expect, there is a substantial reduction in the original association at the primary level, (.57 to .35) but little at the secondary or higher levels.

TABLE 21

RANK ASSOCIATION OF ENROLLMENT BY LEVEL WITH EDUCATIONAL STRUCTURAL DIFFERENTIATION, HOLDING POPULATION CONSTANT: LATIN AMERICA[a]

Enrollment 1960	1960 Educational Differentiation	With Population Held Constant
Primary	.57	.35
Secondary	.79	.71
Higher	.65	.51

[a] Enrollment data: See Table 18. Population data: Union Panamericana, _America en Cifras 1965_: _Situacion Demografica_: _Estado y Movimiento de la Poblacion_ (Washington: 1966), pp. 5-6.

The joint relationship of enrollment and structural differentiation to population accounts for a fairly large proportion of the association between enrollment and structural differentiation at the primary level, but very little of the association at the secondary or higher levels.

Structural Differentiation and Enrollment Ratios

It has already been noted that enrollment _ratios_ are not particularly germane to a consideration of relationships within educational systems. Neither, however, can these data be completely ignored. In spite of the substantial errors to which they are subject[1] such ratios constitute the single most commonly found cross-national educational indicator. This relates to their almost universal availability. Thanks to the efforts of Unesco, enrollment ratios are available for almost all educational systems in the world. Indeed, even among the relatively well-reported Latin American nations, such ratios are the only performance-related data which could be found for all, or even a substantial proportion, of the nations. Consequently the relationship between differentiation and enrollment ratios is of some interest.

Although the association between differentiation and enrollment is quite high, the relationship between enrollment and enrollment ratios is rather low.[2] This could be expected. A nation may have many children in school relative to its neighbors and yet, if it is a very populous nation, have enrolled only a small proportion of those eligible. Conversely, a small nation may enroll almost all of the eligible population and still have relatively few students in its schools. Consequently it is hypothesized that enrollment ratios are related positively to differentiation, but at a lower level than enrollment is related to differentiation. Table 22 presents the rank correlation coefficients computed to test this hypothesis. These data support the hypothesis. It is of some interest to note that over time differentiation is a better predictor of enrollment ratios than enrollment ratios are of differentiation. For purposes of comparison, enrollment ratios in 1950 were related to ratios in 1960. Table 23 presents the results.

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[1] Enrollment data are themselves subject to much error. This error is magnified considerably when they are taken as a ratio to age-specific population figures, for the latter are among the least reliable of all cross-national data.

[2] For 1960 in Latin America the relationships are as follows: primary level--.16; secondary level--.44; higher level--.37.

It is clear that enrollment ratios in 1950 are good predictors of enrollment ratios in 1960. However, at the secondary level, differentiation in 1950 is almost as good a predictor (.53 vs. .56). Turning back to Table 19, the association of structural differentiation with enrollment is in almost every case highest at the secondary level. Just why structural differentiation has this particularly close relationship to enrollment and enrollment ratios at

TABLE 22

RANK ASSOCIATION OF ENROLLMENT RATIOS BY LEVEL, WITH EDUCATIONAL STRUCTURAL DIFFERENTIATION: LATIN AMERICA[a]

Enrollment Ratios	1950 Structural Differentiation	1960 Structural Differentiation
Primary 1950	.37	.26
Secondary 1950	.39	.32
Higher 1950[b]	.45	.32
Primary 1960	.39	.37
Secondary 1960	.53	.45
Higher 1960	.51	.34

[a] Enrollment ratio data taken from: Bau, Table 17, p. 69; Table 18, p. 73; Table 19, p. 77 (See Table 19).

[b] Data taken from: Unesco, World Survey of Education, IV; Higher Education (Paris: 1965).

TABLE 23

RANK ASSOCIATION OF ENROLLMENT RATIOS 1950 WITH ENROLLMENT RATIOS 1960: LATIN AMERICA[a]

Enrollment Ratios 1950	Enrollment Ratios 1960		
	Primary	Secondary	Higher
Primary	.83	.55	.63
Secondary	.55	.56	.48
Higher	.72	.53	.87

[a] For data sources see Table 22.

the secondary level is a puzzle. Pushing the argument a bit farther, the association between secondary enrollment in 1950 and secondary enrollment ratio in 1960 is rather low (.31) but when differentiation in 1950 is considered jointly with 1950 enrollment their multiple association with 1960 enrollment ratio is considerably higher (.54). Systems which had high enrollment in 1950 at the secondary level were not very likely to have relatively high secondary enrollment ratios in 1960. Systems which had high secondary enrollment in 1950 and were also relatively highly differentiated were much more likely to have relatively high enrollment ratios in 1960. This again argues for the strategic nature of structural differentiation in educational systems.

Some Miscellaneous Relationships

Finally, structural differentiation has been associated with a variety of data series having to do with money invested in the educational system, teachers in the system, and number and proportion of students studying abroad. These calculations are in the nature of a preliminary assay. No hypotheses have been phrased.

None of the associations are particularly startling. They are reported in Table 24.

Nations in Latin America which have highly differentiated educational systems are not those which invest the greatest proportion of their GNP in education, nor do they spend the greatest amount of money per pupil. However highly differentiated systems tend to allocate more of their funds to the secondary and higher levels. This last variable must be interpreted cautiously, for a high score on it can represent either a relatively large investment in the secondary and higher levels or a relatively niggardly investment in the primary level. Pupil-teacher ratios are not particularly associated with differentiation.

Latin American nations with highly differentiated educational systems tend to have relatively large numbers of students studying abroad and offer relatively large numbers of fellowships for such study. This may be a reflection of the relationship between differentiation and educational system population. What is of particular note is the moderately high negative relationship between

TABLE 24

RANK ASSOCIATION OF EDUCATIONAL STRUCTURAL DIFFERENTIATION, 1960, WITH A VARIETY OF EDUCATIONAL VARIABLES: LATIN AMERICA

.15	Government expenditure on education as a percentage of GNP, 1960[a]
.20	Primary cost per student in constant dollars, 1960[b]
.10	Secondary cost per student in constant dollars, 1960[c]
.19	Higher cost per student in constant dollars, 1960[d]
.38	Percentage of public education funds allocated to secondary and higher levels, 1960[e]
-.20	Primary pupil/teacher ratio, 1960[f]
-.20	Secondary pupil/teacher ratio, 1960[g]
.38	Number of students studying abroad, 1960[h]
-.42	Above as a percentage of higher level enrollment, 1960[i]
.46	Number of fellowships offered for study abroad, 1960[j]

TABLE 24--*Continued*

.46	Secondary enrollment as a percentage of primary enrollment, 1960[k]
.12	Higher enrollment as a percentage of secondary enrollment, 1960[l]

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[a] O.J. Bardeci and F. Escondrillas, *Financiamiento de la Educacion en America Latina*, Union Panamericana (Washington: 1963), Cuadro No. 13, p. 32.

[b] *Ibid.*, Cuadro No. 18, p. 42.

[c] *Ibid.*

[d] *Ibid.*

[e] *Ibid.*, Cuadro No. 5, p. 16.

[f] Union Panamericana, *Perspectivas de Desarollo de la Educacion en 19 Paises Latinoamericanos (1960-1970) Anexos*, Cuadro 28, p. 52.

[g] *Ibid.*, Cuadro 29, p. 53.

[h] Unesco, *Study Abroad: International Handbook of Fellowships, Scholarships, Educational Exchange*, XIV, 1963 (Paris: 1962), Table III, pp. 702-09.

[i] *Ibid.*, Table I, pp. 695-97.

[j] *Ibid.*

[k] Centro para el Desarollo Economico y Social de America Latina, "Tipologia Socio-Economica Latinoamericana," *Mensaje* (Mexico), No. 123 (Octubre, 1963), p. 683.

[l] *Ibid.*

differentiation and number of students studying abroad as a percentage of domestic higher enrollment. One would expect nations with highly differentiated educational systems, with a greater variety of types of schools available, to have to send relatively small proportions of their students abroad to receive specialized training. The last two coefficients in the table may reflect the fact that differentiation is highly associated with both secondary and higher enrollments.

CHAPTER VI

SOME BOUNDARY-CROSSING RELATIONSHIPS

In the following pages consideration will be given to two broad questions. First, to what sorts of environmental changes is educational structural differentiation a response? That is, to what is an educational system typically adapting, what information is it mapping into itself, when its structure differentiates? Conversely, to what sorts of changes is differentiation not likely to be a response? Second, what is the effect of educational structural differentiation upon the environment? What sorts of extra-educational system variables does it affect, and upon which does it have little or no impact? In short, concern will be with inputs into the educational system and outputs from it, and the role of structural differentiation in these boundary-crossing relationships.[1]

Two broad limitations upon the work reported in this chapter should be given particular emphasis. First, the relationships examined here are dynamic and on-going, but the available data and analytic techniques permit only a static consideration of them. By using data from two points in time, 1950 and 1960, this study can give some idea of the dynamics involved, but it is nontheless a less than ideal approach.

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[1] For reasons which have been noted earlier, no direct consideration of feedback relationships can be undertaken here.

To discuss the second limitation further attention must be given to the general nature of input and output. To speak of a system mapping information concerning environmental change into its structure says nothing directly about how this actually occurs. Such information is not automatically fed into the educational system. Although systems analysis can tend to blind one to the fact, it cannot be forgotten that the parts and programs of educational systems are the products of decisions made and actions taken by people. The information may have an impact upon the system in the form of demands which are channeled through the political system, producing new legislation, or new ministerial policies and programs, or budget cuts. It can impact upon the system through the perceptions of various actors within the system. It may take the form of changes in the characteristics of the students who enter the system. The author knows of no way to deal directly with these processes through which information may enter a system in a comparative study of a large number of societies. One can measure variables outside the education system, changes in which presumably affect that system, and one can measure dimensions of the educational system along which the new information is presumed to produce change. But the actual channels through which the information flows, the communicative links themselves, cannot yet directly be considered.[1]

Somewhat the same problem is encountered when considering output relationships. Gross makes a useful distinction between system output and system outcome, or interest satisfaction. Output is the actual product of the system--in the case of educational systems, whatever it is which is "added to" students as they pass through the system, and the new information generated by the system.

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[1] This is not meant to imply that these communicative links are unmeasurable--only that they have not yet been measured. This is perhaps another area where mathematical net theory can be usefully applied.

Outcome has to do with the effects of this output upon other systems.[1] It has been noted at several points that no direct measure of educational output is available, and that enrollment ratios are the most commonly used surrogate in cross-national studies. Similarly there is no direct way available to measure cross-nationally the channels through which output becomes outcome. Once again, one can only measure educational system characteristics which appear to be related to output, and characteristics of systems presumably affected by educational system outcome. Thus, in attempting to assess relationships between educational systems and other systems, this analysis deals in a very general fashion with intersystem linkages whose precise nature remains unclear.

A General Hypothesis

To what sorts of variables is educational structural differentiation likely to be related? In what sort of national social system is one likely to find a highly differentiated educational system? Structural differentiation in educational systems is a process of increasing specialization--it refers to the establishment of more specialized structural elements. Most of the elements of highly-differentiated systems are either 1) specialized information-producing entities, or 2) specialized schools, which can be thought of as entities for the transmission of specialized information. Highly differentiated educational systems are likely to be found, then, in societies which have a high capacity to channel diverse types of information, which can both demand and absorb such information--that is, in societies which are highly differentiated in spheres other than the educational system.[1]

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[1] Gross, pp. 233-34.

It is suggested that the information-processing capacity of a national system, its differentiation, is an aspect or dimension of development or modernization which is quite different from that to which the generally used indicators of development refer. The traditional data series which are used to measure development, such as per capita income, large scale urbanization, radio, newspaper and telephone distribution, commercial energy consumption, measures of food consumption and medical services, educational enrollment ratios, etc., all have been repeatedly found to be highly interrelated. Several studies have found that under factor analysis these indicators yield only one, or a very few, factors.[1] The difficulty is (and as noted in Chapter III this is an important weakness of factor analysis) that no one knows for sure just what the single factor, or very few factors, should be called.

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[1] Cf. Coleman, p. 537, for a useful discussion of elite differentiation as a producer of educational differentiation. Unfortunately, however, Coleman overstates the case, claiming that elite differentiation and consequent educational differentiation are inevitable in developing societies. As the following pages will show, this is not the case. (Unless of course elite differentiation and consequent educational differentiation are included in the definition of development, in which case the argument is tautologous.)

Following the policy adopted by Young, the term "urbanization" will be used here to refer to the traditional development indicators.

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[1] See for example Theodore Caplow and Kurt Finsterbusch, "A Matrix of Modernization," paper prepared for presentation at the 1964 meetings of the American Sociological Society (New York: Columbia University, Bureau of Applied Social Research, 1964); Leo F. Schnore, "The Statistical Measurement of Urbanization and Economic Development," Land Economics, XXXVII (August, 1961) 229-45; Brian J. Berry, "A Statistical Analysis," in Ginsburg; and Sawyer.

> What is proposed is that what has been called development heretofore might better be termed urbanization, in the sense of the growth of very large cities. This is a crucial distinction, in that urban growth does not always mean a modernized economy, nor is it always accompanied by integrated development of the country as a whole. . . .The goal of developers is not urbanization regardless of the type of economy in which the city is embedded, but the development of a wholly integrated and modern nation.[1]

One might of course, use some other summary term, such as "wealth," to refer to these interrelated indicators. However, it is commonplace to note that most of the changes which are referred to in discussions of development are city-bound, or at least occur first in large urban areas. Indeed much of the vast literature relating to "national integration" or "nation-building" has to do with the problem of spreading such changes from the cities where they typically originate to the hinterland.[2] Moreover, as Young has noted, most of the traditional development indicators refer to minimum facilities or conditions for a large city to survive today. Certain basic health and sanitation provisions, electric power, communications facilities, mass media, all of these are necessary if large numbers of people are going to live in close quarters.[1] Consequently urbanization is considered an appropriate summary term for whatever it is that the highly interrelated traditional development indicators refer to.

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[1] Ruth Young, p. 132.

[2] See, "Education and National Integration," Chapter 3 in Adams and Farrell.

It is of particular note for this work that educational enrollment ratios have been found in study after study to relate rather closely to urbanization measures. For example, Harbison and Myers report, using data from seventy-two nations which range in size and complexity from Ethiopia and Somalia to the United States, that enrollment ratios correlate as follows with GNP per capita: first level enrollment ratio--.668; combined first and second level ratio--.732; second level ratio--.817; third level ratio--.735.[2] Russett reports, using a slightly different sample of societies, that combined primary and secondary enrollment ratio correlates highly with such variables as newspaper circulation ($r = .88$), number of radios per 1000 inhabitants ($r = .83$), number of persons per physician ($r = .86$), and so on.[3] There is no need to cite further evidence on this point. The relationship of enrollment ratios with such variables as are here called urbanization measures has become almost folklore in the study of national development.

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[1] Ruth Young, p. 140.

[2] Harbison and Myers, p. 39.

[3] Russett, p. 283.

Measures of urbanization are not necessarily related to the differentiation or information processing capacity of a society. High per capita income can result, as has been noted, from growth in only one economic sector, frequently in an extractive enterprise. An extensive transportation and communication network can be established to serve the requirements of a simple undifferentiated plantation or extractive economic system. Relatively high enrollment ratios can be achieved by relatively undifferentiated educational systems. This is not to say that urbanization is wholly unrelated to societal differentiation or information processing capacity. Highly diversified industrial systems are typically found in highly urbanized societies. The point is simply that the two are not necessarily closely related, and are not identical.

The proposition is advanced, then, that there are two, at least, quite distinct dimensions of development. One is here being called urbanization. The other, the information processing capacity or differentiation of systems other than the educational system will be called, borrowing a term from Young, "communicability." This will hopefully avoid confusing this dimension with the structural differentiation of educational systems.

Communicability and urbanization are somewhat, but by no means perfectly, related. Each relates to a different educational system dimension. It is suggested that demands created by urbanization produce pressures for raising enrollment ratios in educational systems, but that urbanization does not necessarily or directly produce demands for greater educational structural differentiation.[1] Conversely, communicability may not directly produce demands for enrollment increases (sufficiently rapid to raise enrollment ratios) but it does produce demands for specialized information, the production and transmission of which is the presumed justification for the creation of the specialized educational entities whose establishment is here called structural differentiation.

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[1] From the analysis in the preceding chapter it could be suggested that urbanization, by producing enrollment increases, will eventually bring about increased structural differentiation. This may be the case, but the relationship would be less direct than the relationship between communicability and structural differentiation. This suggestion will be considered in more detail in the following pages.

A major hypothesis of this study is that educational structural differentiation and enrollment ratios have markedly different patterns of relationship with non-educational variables. Those variables to which structural differentiation is highly related will have a lower relationship with enrollment ratios, and vice versa. More specifically, it is hypothesized that differentiation will relate most strongly to measures of communicability, and that enrollment ratios will relate most strongly to measures of urbanization.

The Data Used

Bearing in mind the methodological principles advanced in Chapter II, a large body of data has been assembled by the author.

Indicators of Communicability

Several indicators of communicability have been developed by Young. There is first a scale of the communicability of total national systems, measuring the extent to which "there are differentiated publics which have institutionalized means of exchanging differing and conflicting sets of information and opinion."[1] In relation to the economic system, there are two scales, one measuring "economic flexibility" and the other "industrial diversity."[2] All of these can be found in Appendix A.

One of the most direct measures of the ability of an economic system to produce and use new information is number of patents filed. Unfortunately, many nations either do not have patent offices, or do not publish patent statistics. The measure which is used therefore is number of patents filed with the United States Patent Office. Among the thirty-three nations for which domestic patent information is available the rank association between number of patents filed domestically and number filed in the United States is .50.[1] This is a moderately high association, but some information is obviously lost when this surrogate is used.

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[1] Ruth Young, p. 143.

[2] It should be noted that Young refers to national communicability and economic flexibility as separate dimensions (the latter measured by the scales of both economic flexibility and industrial diversity). The two are closely related, but have slightly different patterns of relationship with some other variables (Ibid., pp. 144-45 and Table 34, p. 133). This distinction will not be pursued here, as concern is to identify a common characteristic of non-educational social systems which relates to educational structural differentiation. This broad characteristic, differentiation or information processing capacity, is here, for convenience, called communicability, regardless of the system in which it may be found.

Young has also developed several measures of social rigidity--"The degree to which a society's structure is based on ascriptive criteria"--which she suggests is the polar opposite of communicability.[2] All of these measures have a rather high negative association with communicability. Liewen's typology of the penetration of the military into political life in Latin America has already been discussed. It can be taken as an index of governmental rigidity.[1] Shapiro has provided a five-fold classification of governments in Latin America. The categories are, from more to less rigid: 1) cuadillo, 2) conservative with some degree of political democracy, 3) newly established liberal regimes, 4) revolutionary regimes, 5) post-revolutionary regimes.[2] Revolutions can be taken as one indicator of the weakening of social rigidity. Using Richardson's statistics concerning "deadly quarrels" from 1820 to 1945 Young has developed a measure of the number of revolutions, "quarrels involving a national group or some lower level of government with a higher unit of government."[3] Two measures of political competitiveness correlate rather well with the scale of communicability. Cutright's index of political development has already been discussed.[4] Almond and Coleman have provided a three-fold classification of nations as politically competitive, semi-competitive, and authoritarian.[1]

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[1] _Ibid._, p. 49. Patent data have been supplied by Ruth Young. Original sources are _Journal of the Patent Office Society_, XLVI (February, 1964), 83-171; United Nations, _The Role of Patents in the Transfer of Technology to Developing Societies_ (New York: 1964); and United International Bureaux for the Protection of Intellectual Property, _Industrial Property_, II (December, 1963), 274-76, and III (December, 1964), 276.

[2] Young, Chapter I and pp. 41-42.

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[1] Liewen.

[2] Samuel Shapiro, Invisible Latin America (Boston: Beacon Press, 1963), Chapter 2.

[3] Young, p. 42. Original data source, Lewis F. Richardson, Statistics of Deadly Quarrels (Pittsburg: The Boxwood Press, 1960).

[4] Cutright.

The three scales developed by Young, and the patents measure, all refer to approximately 1960. The other less direct measures are not referable to a particular date, although they purport to measure conditions in the recent past. In order to get comparable measures for an earlier point in time the present author has replicated the scales of economic flexibility and industrial diversity for 1950. These new scales can be found in Appendix A.

Two additional indicators of rigidity relate to approximately 1940: percentage of population classified as White, and percentage classified as Indian. As racial classifications, these data are rightly regarded with suspicion, since nations apply the terms "Indian" and "White" quite differently. The terms are more appropriately regarded as referring to locally defined social categories. But for the present work this is not a problem. As Young has noted:

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[1] Almond and Coleman, p. 535. An additional classification of political systems as modern, traditional or mixed is provided in this work. In light of the statement that the most general characteristic of a modern system is "the relatively high degree of differentiation, expliciteness and functional distinctiveness of political and governmental structure (p. 532) it is too bad that all but two (Chile and Uruguay) of the Latin American societies are classified as mixed. Indeed, of seventy-five societies treated, only four are classified as traditional and three as modern. All the rest are mixed. Although starting from an interesting premise the typology is thus analytically useless.

> But this fault of labelling, which makes for an inaccurate count of members of racial groups, works to the advantage of the present study. Whatever it does not do, the count of Indians clearly indicates the number of persons that the nation regards as disenfranchised persons excluded from national economic and political participation. Therefore it serves as an excellent indicator of the extent of social rigidity in a nation.[1]

Measures of Urbanization

Data have been collected for a large number of urbanization measures for both 1950 and 1960. Most of these measures will be familiar to the reader who is acquainted with the literature on national development. Two of the measures used require some comment. Phillips Cutright has developed a scale of social security program coverage. Unfortunately he has not reported the rankings of nations on the scale, only the ranking of items. Therefore, a scale of social security program coverage was developed for this study (see Appendix A). The items are quite similar to those used by Cutright.[1] The combined index of economic development, 1950, brings together in one measure data relative to illiteracy, urbanization, GNP per capita and percentage of the economically active population in the primary sector.[2]

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[1] Ruth Young, p. 44.

In summary, to test the general hypothesis phrased above, the following data have been collected for 1950 and 1960: a scale of educational structural differentiation, primary, secondary and higher level school enrollment ratios, fourteen measures of communicability, and thirty-nine measures of urbanization. In light of this assemblage of data, the general hypothesis can be broken down into a series of specific hypotheses.

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[1] Phillips Cutright, "Political Structure, Economic Development, and National Social Security Programs," _American Journal of Sociology_, LXX (March, 1965), 537-50.

[2] Union Panamericana, _Estudio Economico y Social de America Latina, 1961 Segunda Parte, Aspectos Sociales_, II, _Cuadros y Figuras_ (Washington: 1963), Cuadro 10, p. 228.

The Evaluation of Eight Specific Hypotheses

These specific hypotheses can be represented most expeditiously as follows.

A1--urbanization 1950
B1--communicability 1950
C1--enrollment ratio 1950
D1--educational structural differentiation 1950

A2--urbanization 1960
B2--communicability 1960
C2--enrollment ratio 1960
D2--educational structural differentiation 1960

Hypotheses:

(1) (Bn,Dn) is positive and high.

(2) (An,Cn) is positive and high.

(3) (An,Cn) is higher than (An,Dn).

(4) (Bn,Dn) is higher than (Bn,Cn).

(5) (A1,C2) is higher than B1,C2).

(6) (B1,D2) is higher than (A1,D2).

(7) (C1,A2) is higher than (D1,A2).

(8) (D1,B2) is higher than (C1,B2).

Each of these eight hypotheses is discussed separately in the following pages. A brief summary of the conclusions reached follows the separate discussions. The rank associations calculated in order to test these hypotheses are reported in Table 25. Hypotheses (1) and (2) predict high positive associations between communicability and structural differentiation and between urbanization and enrollment ratios, at any point in time.

Hypothesis (1)

Hypothesis (1) receives substantial support from these data. The rank associations between the various measures of communicability and educational structural differentiation are almost all very high. Industrial diversity, 1950 and 1960, economic flexibility, 1950, number of patents filed with the U. S. Patent Office, and the Coleman index of political competitiveness are particularly highly associated with educational structural differentiation. Young's scale of national communicability has a relatively moderate relationship with differentiation. It appears that differentiation in the educational system

TABLE 25

RANK ASSOCIATIONS OF EDUCATIONAL STRUCTURAL DIFFERENTIATION AND ENROLLMENT RATIOS, BY LEVEL, WITH A VARIETY OF URBANIZATION AND COMMUNICABILITY MEASURES LATIN AMERICA[a]

Measures of Communicability	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
Young scale of communicability 1960	.48	.47	.33	.26	.34	.26	.24	.42
Young scale of economic flexibility 1960	.51	.64	.26	.02	.43	.22	.27	.32
Young scale of industrial diversity 1960	.85	.82	.29	.33	.29	.29	.43	.38
Patents filed in U.S. Patent Office 1960	.83	.59	.30	-.04	.43	.22	.34	.36
Lieuwen typology armed forces in politics	.56	.51	.23	.06	.64	.30	.49	.59

TABLE 25--Continued

Measures of Communicability	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enroll ment ratio 1960	Higher enrollment ratio 1960
Shapiro classification types of government	.51	.56	.06	.00	.35	.15	.38	.37
Number of revolutions	.66	.78	.23	.24	.46	.28	.34	.34
Number of wars	.58	.62	.27	.36	.34	.26	.20	.37
Cutright measure of political development	.36	.36	.38	.53	.34	.27	.35	.38
Coleman index of political competitiveness	.82	.81	.50	.71	.69	.54	.61	.56
Scale of economic flexibility 1950	.81	.69	.40	.43	.49	.41	.44	.57
Scale of industrial diversity 1950	.75	.77	.23	.37	.44	.27	.39	.38
Percentage of population White 1940	.42	.44	.30	.15	.43	.34	.57	.51

TABLE 25--Continued

Measures of Communicability	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
Percentage of population Indian 1940	-.33	-.42	-.39	-.04	-.46	-.40	-.47	-.41
Measures of Urbanization 1960[b]								
Telephones per capita	.64	.58	.66	.26	.56	.61	.74	.58
Per capita consumption commercial energy	.60	.58	.37	.11	.47	.42	.51	.44
Average rate urbanization 1945-55	.58	.60	.49	-.02	.49	.50	.50	.41
GNP per capita 1957	.14	.25	.40	.00	.45	.44	.42	.16

TABLE 25--Continued

Measures of Urbanization 1960^b	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
Percent of population economically active	.01	-.08	-.11	.29	-.12	-.08	-.05	.12
Percentage of population in communities of 2500 or more	.63	.59	.55	.19	.58	.57	.60	.54
Percentage of population in communities of 100,000 or more	.44	.43	.59	.19	.60	.63	.55	.63
Electricity generation kwh per capita	.55	.60	.48	.15	.51	.46	.63	.49
Industrial employment as a percentage of urban population	.43	.39	.32	.27	.27	.33	.40	.30

TABLE 25--Continued

Measures of Urbanization 1960[b]	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
Rate growth of imports	.25	.23	.01	.02	.10	.06	.10	.23
Percentage of GDP due to manufacturing	.72	.74	.11	.14	.18	-.02	.06	.19
Percentage illiterate	-.43	-.43	-.73	-.26	-.68	-.78	-.64	-.63
Newspaper circulation per 1000 population	.48	.42	.56	.40	.59	.52	.68	.55
Newsprint consumption	.67	.58	.52	.33	.48	.54	.64	.57
Number of radio transmitters	.47	.45	.08	.18	.01	.17	.27	.25
Radio receivers per 1000 population	.42	.43	.37	.09	.32	.46	.52	.42
International mailflow pre-1956	.36	.31	.42	-.06	.58	.33	.44	.43

'85

TABLE 25--Continued

Measures of Urbanization 1960[b]	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enroll ment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
Motor vehicles per 1000 population	.61	.47	.40	.02	.49	.39	.58	.55
Road density km. per 1000 square miles	.02	-.05	.09	.07	.02	.03	.02	-.06
Rail density km. per 1000 square miles	.05	-.03	.11	-.02	.10	.14	.13	.08
Social security coverage scale	.45	.46	.55	.76	.66	.58	.57	.71
Calories consumed per day per capita 1958	.55	.46	.40	.07	.38	.44	.47	.40
Proteins consumed per day per capita 1958	.42	.34	.46	.07	.24	.44	.38	.38
Hospital beds per capita	.50	.33	.42	.32	.37	.46	.70	.49

'86 (4)

TABLE 25--Continued

Measures of Urbanization 1960[b]	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
Percentage of urban population served by piped water 1958-1961	.37	.36	.51	.13	.51	.47	.59	.52
Persons per physician	-.46	-.38	-.43	-.18	-.46	-.42	-.36	-.44
Infant mortality rate	.10	-.09	.07	-.39	.04	.02	.13	.01
Gross mortality rate	.11	.02	.24	-.17	.27	.25	.35	.26
Measures of Urbanization 1950								
Average rate of urbanization pre-1950 intercensal period	-.08	.43	-.14	-.50	.43	-.06	.03	.11

TABLE 25--Continued

Measures of Urbanization 1950	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
GNP per capita	.46	.35	.41	.00	.38	.32	.54	.37
Percentage population economically active	-.16	-.13	-.20	.04	-.26	-.02	-.06	.03
Percentage population in communities of 20,000 or more	.56	.70	.48	.26	.51	.49	.55	.52
Percentage of GDP due to manufacturing	.75	.83	.26	.39	.29	.12	.18	.32
Percentage illiterate	-.36	-.44	-.73	-.23	-.60	-.72	-.62	-.55
Combined index of economic development	.55	.59	.63	.17	.57	.66	.72	.57
Number of radio transmitters	.68	.74	.22	.27	.32	.27	.35	.32

TABLE 25--Continued

Measures of Urbanization 1950	Educational structural differentiation 1950	Educational structural differentiation 1960	Primary enrollment ratio 1950	Secondary enrollment ratio 1950	Higher enrollment ratio 1950	Primary enrollment ratio 1960	Secondary enrollment ratio 1960	Higher enrollment ratio 1960
Radio receivers per 1000 population	.59	.49	.58	.33	.53	.60	.58	.64
Infant mortality rate	.06	-.14	.13	-.22	.09	.20	.23	.07
Gross mortality rate	.13	-.09	.33	.02	.31	.33	.51	.29

[a] For data sources, see Appendix C

[b] Those few measures which refer to a date more than one year removed from 1960 are noted.

may be less a response to the communicability of a total society than to the communicability of the economic or political systems. A highly differentiated educational system is very likely to be found in a society with a highly differentiated economic system. It is probably the case that the demands for specialized information and personnel can be most easily communicated to an educational system in a society which has a highly competitive political system. The general ability of a society to exchange information between varying power centers, tapped by the communicability scale, is apparently of less direct relevance to an educational system (although it has a moderately high association with structural differentiation) than is the competitiveness of the political system itself.

The Cutright measure of political development does not relate at a high level with educational structural differentiation. It may be that simply having long experience with competitively elected legislatures and executives is not particularly relevant to the ability of a society to transmit demands generated in one system (e.g., the economic system) to a responding system (e.g., the educational system). What is perhaps more relevant is the extent to which various segments of the society may participate in the competition for legislative and executive offices. The importance of this distinction in Latin America is marked in a comment by Blanksten:

> Most of the major parties in the competitive systems of Latin America are what might be called 'traditional' political parties. . . . The traditional parties draw their membership, in terms of the class system of Latin America, primarily from the upper class, with mestizos and Indians virtually excluded from direct participation in these parties.[1]

The qualitative judgemental ratings used for constructing the Coleman index of competitiveness may much more nearly approximate the actual openness of Latin American political systems. For example, Uruguay, in which one party has won every national election since 1868, is nontheless rated as competitive on the Coleman index. Similarly, Mexico, where one party has long held a virtual monopoly of political power, is rated as semi-competitive. Conversely, Nicaragua, with an elective legislature and functioning political parties, (and a consequent relatively high score on the Cutright index) is classified as authoritarian on the Coleman index.[1] The rather moderate relationship evidenced between educational structural differentiation and percentage of population White and percentage of population Indian may be a factor of the earlier date to which the latter two measures refer. Or it may indicate that these are not particularly germane indicators of rigidity for considering educational system cum society relationships.

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[1] George I. Blanksten, "The Politics of Latin America," in Almond and Coleman, p. 481.

Hypothesis (2)

In considering the evidence relating to Hypothesis (2) what is striking is the generally moderate to low relationship between enrollment ratios and urbanization. None of these associations are as high as the highest relationships between structural differentiation and communicability. Of the thirty-nine urbanization measures used here, only ten are related to most of the enrollment ratio measures at a level higher than .50. Of these ten, two are measures of illiteracy in 1950 and 1960, and two more, newspaper circulation and newsprint consumption, are directly dependent upon literacy. It would be somewhat surprising if these variables were not rather well associated with enrollment ratios. The remaining six urbanization measures rather highly associated with enrollment ratios are telephones per 1000 population, percentage of population in communities of 2,500 or more and of 100,000 or more--1960, the social security coverage scale, the combined index of economic development--1950, and number of radio receivers--1950.

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[1] For Uruguay and Mexico, see Almond and Coleman, pp. 480-81, 534. For Nicaragua, see Ibid, p. 534 and Young, pp. 38-39.

Fifteen of the urbanization measures relate to enrollment ratios at inconsequential levels: percentage of population economically active--1950 and 1960, industrial employment as a percentage of urban population--1960, rate of growth of imports, percentage of GDP due to manufacturing--1950 and 1960, number of radio transmitters--1950 and 1960, road and rail density, infant mortality rate--1950 and 1960, gross mortality rate--1950 and 1960, and average rate of urbanization 1940-1950.

One possible explanation for these findings would be that the variables highly related to enrollment ratios measure a different dimension than those related at a low level--that is, that it is not appropriate to consider all of these variables to be measures of a single dimension, urbanization. This explanation can be fairly readily rejected. There is no clearly observable systematic difference between the specific content of the strongly related and the weakly related variables. Moreover, as has been noted, study after study reports that all of these variables are highly interrelated. The most recently reported large-scale cross-national factor analysis used data series identical or equivalent to twenty-six of the urbanization measures used in this study. All but one of the twenty six variables are predicted by and included under a single factor, called "wealth." The one remaining variable is related both to wealth and to another factor.[1]

It is concluded, then, that Hypothesis (2) receives rather equivocal support from this data. In ten cases the relationship between enrollment ratios and urbanization measures is fairly high, in fourteen cases it is quite low, and in the remaining fifteen cases the coefficients of rank association range mostly between .30 and .50--non-trivial but not very high.

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[1] Sawyer, Table 3, particularly Sections B and F, pp. 162-67.

This throws some interesting light on the results of previous studies which have found a very high correlation between enrollment ratios and some of the urbanization measures used here. Perhaps the best way to compare coefficients obtained in previous studies, which have usually used the Pearson product-moment correlation statistic, with the results reported in Table 25 is in terms of proportional reduction in error of estimation (P.R.E.) made possible by the relationship.[1] It is well known that the square of a Pearson product-moment correlation coefficient represents P.R.E. It has been noted above that if there are no ties on either variable the absolute value of a Tau coefficient of rank association represents P.R.E. For most of the rank associations between enrollment ratios and urbanization measures there are no ties, or very few ties, on either variable. Consequently, the absolute values obtained here can be considered as more or less comparable to the square of the product-moment correlations between these same variables. Product-moment correlations between enrollment and urbanization measures generally produce coefficients above .70--frequently much above that figure. A correlation of .70 is approximately equivalent to a Tau of .49. Of the 234 separate rank associations calculated between enrollment ratios and urbanization measures fewer than one-third (thirty-two percent) are at the level of .49 or higher.[1]

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[1] Costner.

The relationships between enrollment ratios and urbanization measures reported here are thus lower--often far lower-- than those usually reported. It is suggested that previous large-scale cross-national statistical studies have substantially overestimated this relationship. This appears to be the result of two practices common among previous studies. Most have included in their analysis not only the developing nations but all (or most) of the highly developed "Western" nations. Since the developed nations tend to all have high and nearly identical scores on most urbanization measures (nearly identical, that is, in relation to the range of scores for all societies)[1] their common presence tends to artifically inflate correlation coefficients. The difficulty is compounded when the Pearson product-moment statistic is used, for it is very much influenced by the presence of a few extreme values on the measures being correlated. When a very wide range of nations is included, almost every data series will have a few extreme values at either end. For example, Ginsburg's mid-1950s data on GNP per capita range from $40 (Nepal) to $2343 (U.S.A.). The highest score is nearly twelve times as great as the mean score. Similarly, the scores on the variable, electricity generation in kilowatt-hours per capita, 1955, range from 1 (Laos) to 6622 (Norway), with the highest score again being nearly twelve times as great as the mean.[2]

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[1] Note particularly the associations between GNP per capita 1950 and 1960 and enrollment ratios. Of the twelve coefficients only one--GNP per capita 1950 with secondary enrollment ratio 1960--is above .49.

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[1] Inspection of the maps, distribution curves and tables for the variables reported in Ginsburg illustrate clearly this pattern. Cf. Russett _et al_.

[2] Ginsburg, pp. 18, 88.

This study, using a rank association statistic and dealing with a limited range of nations, does not suffer from either of these difficulties. Thus, the lower values reported here are less statistically artifactual and more nearly approximate the actual relationship between enrollment ratios and urbanization within the Latin American region.[1] Up to this point, then, it is apparent that communicability and educational structural differentiation are, as was hypothesized, highly and positively related. However, urbanization is less closely associated with enrollment ratios than has been thought. It appears that previous studies have overestimated the latter relationship, owing to the nature of their samples and the statistic used.

Hypothesis (3)

Hypothesis (3), that enrollment ratios relate more closely to urbanization measures than does structural differentiation, is even less well supported by these data than is Hypothesis (2). Of the thirty-nine urbanization measures, almost half--seventeen--are about as closely related to differentiation as to enrollment ratios. Ten are more closely related to structural differentiation and only twelve are clearly more closely related to enrollment ratios.

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[1] The extent to which this finding is generalizable to other developing areas is considered below.

The question arises, recalling the evidence presented in the preceding chapter, whether the relatively high association between urbanization and differentiation is an artifact of the strong association between differentiation and enrollment. That is, it might be the case that urbanization produces enrollment increases (by increasing demand for schooling and/or by making more money available to support schooling), which in turn leads to increased differentiation. To consider this possibility the multiple association of several urbanization measures in 1950 and enrollment 1960 with structural differentiation 1960 have been calculated. The results are found in Table 26. The multiple association produces a large increase over the simple association between urbanization 1950 and differentiation 1960 only when GNP per

TABLE 26

SIMPLE AND MULTIPLE RANK ASSOCIATIONS BETWEEN URBANIZATION 1950, EDUCATIONAL STRUCTURAL DIFFERENTIATION 1960 AND ENROLLMENT, BY LEVEL, 1960[a]

Simple Association:		
GNP per capita 1950 with structural differentiation 1960		.35
Multiple Associations:		
adding primary enrollment 1960	.64	
adding secondary enrollment 1960	.79	
adding higher enrollment 1960	.66	
Simple Association:		
Percentage of GDP due to manufacturing 1950 with structural differentiation 1960		.83
Multiple Associations:		
adding primary enrollment 1960	.84	
adding secondary enrollment 1960	.86	
adding higher enrollment 1960	.83	
Simple Association:		
Percentage of population in communities of 20,000 or more 1950 with structural differentiation 1960		.70
Multiple Associations:		
adding primary enrollment 1960	.77	
adding secondary enrollment 1960	.83	
adding higher enrollment 1960	.75	
Simple Association:		
Number of radio receivers per 1000 population 1950 with structural differentiation 1960		.49
Multiple Associations:		
adding primary enrollment 1960	.67	
adding secondary enrollment 1960	.80	
adding higher enrollment 1960	.68	

[a] For data sources see Table 25.

capita is used to measure urbanization. The relationship between urbanization and differentiation appears to be somewhat, but to no great extent, attributable to the intervening effect of enrollment.

Hypothesis (4)

Hypothesis (4) receives very substantial support. In ten of fourteen cases communicability measures are more closely related to structural differentiation than to enrollment ratios. Moreover, among these ten, the coefficients of association with structural differentiation are for the most part considerably higher than those with enrollment ratios.

The discussion of hypotheses (1), (2), (3), and (4) has been concerned with the relationships between the four dimensions at the same point in time. The remaining four hypotheses refer to the relationships among the dimensions over time. In light of the evidence concerning the first four hypotheses the evidence relative to the latter four presents no surprises. The discussion of each will therefore be brief.

Hypothesis (5)

Hypothesis (5) suggests that enrollment ratios in 1960 are more strongly predicted by urbanization in 1950 than by communicability in 1950. This hypothesis is not supported. Communicability is as good a predictor of enrollment ratios as is urbanization.

Hypothesis (6)

Hypothesis (6) suggests that structural differentiation in 1960 will be more strongly predicted by communicability in 1950 than by urbanization in 1950. This turns out generally to be the case, although three of the 1950 urbanization measures--percentage of population urban, percentage of GDP due to manufacturing, and number of radio transmitters--predict 1960 differentiation as well as the two 1950 communicability measures.

Hypothesis (7)

Hypothesis (7) is not supported. It is not the case that urbanization in 1960 is better predicted by enrollment ratios in 1950 than by differentiation in 1950.

Of the twenty-eight 1960 urbanization measures half are most strongly related to 1950 structural differentiation, and four fewer--ten--are more strongly related to enrollment ratios.

Hypothesis (8)

Hypothesis (8), that communicability in 1960 is better predicted by 1950 structural differentiation than by 1950 enrollment ratios, is supported. Each of the four 1960 communicability measures is very much more highly associated with 1950 structural differentiation than with 1950 enrollment ratios.

Summary

The following statements summarize the results of this analysis. Educational structural differentiation and communicability are very highly associated. Enrollment ratios and urbanization are positively associated but at a moderate level. Educational structural differentiation is about as closely associated with urbanization as are enrollment ratios. Educational structural differentiation is much more closely associated with communicability than are enrollment ratios. Examining these relationships over time, communicability in 1950 predicts enrollment ratios in 1960 about as well as does urbanization in 1950. However, educational structural differentiation in 1960 is much better predicted by communicability than by urbanization. Urbanization in 1960 is about as well predicted by 1950 educational structural differentiation as by 1950 enrollment ratios. However, educational structural differentiation in 1950 is a much better predictor of 1960 communicability than are 1950 enrollment ratios.

In general, the predictions concerning the relationships between communicability and educational structural differentiation were accurate. However, the relationship between enrollment ratios and urbanization was overestimated, and the relationship between educational structural differentiation and urbanization was underestimated. It appears that educational structural differentiation plays an important role in a greater variety of boundary-crossing relationships than had been thought, and that increasing enrollment rapidly enough to raise enrollment ratios is not highly associated with any of the boundary-crossing relationships considered here. The relative importance of these two educational system dimensions will be considered further in the last section of this chapter.

Generalizability of the Findings

To determine the extent to which these results might be generalizable the rank associations of structural differentiation and primary enrollment ratios with a selected set of communicability and urbanization measures have been calculated for the forty-nine nation set, using data referable to approximately 1960. The coefficients obtained are reported in Table 29. The Latin American pattern appears to hold for the large group of nations. The communicability measures are much more strongly associated with structural differentiation than with primary enrollment ratio. Structural differentiation is about as well related to the urbanization measures as is primary enrollment ratio. Moreover, the associations

TABLE 27

RANK ASSOCIATIONS OF EDUCATIONAL STRUCTURAL DIFFERENTIATION AND PRIMARY ENROLLMENT RATIO WITH SELECTED MEASURES OF COMMUNICABILITY AND URBANIZATION: FORTY-NINE NATIONS[a]

	Educational Structural Differentiation	Primary Enrollment Ratio[i]
Measures of Communicability		
Young scale of communicability[a]	.50	.21
Young scale of economic flexibility[b]	.55	.12
Patents filed in U.S. patent office[c]	.86	.26
Young scale of industrial diversity[d]	.58	.04
Measures of Urbanization		
Per capita income in $U.S.[e]	.24	.36
Telephones per 1000 population[f]	.22	.25
Percentage of population in communities of more than 100,000[g]	.14	.28
Commercial energy consumption per capita[h]	.29	.21

[a] Ruth Young, pp. 33-35.

[b] *Ibid*., pp. 53-55.

[c] See Table 25.

[d] Ruth Young, pp. 60-62.

[e] Russett *et al*., Table 44.

[f] United Nations, *Statistical Yearbook 1963*, Tables 2 and 158.

[g] United Nations, *Demographic Yearbook*, 1960 (New York: 1960), Table 6.

[h] United Nations, *Statistical Yearbook*, 1964, Table 131.

[i] Ginsburg, Table XV.

between primary enrollment ratio and urbanization are universally quite low.

A Model of Boundary-Crossing Relationships

In order to develop a model accurately depicting the patterns of relationships among educational structural differentiation, enrollment ratios, urbanization and communicability it will prove useful to make explicit another set of conclusions which can be drawn from the evidence presented in this chapter and the preceding chapter. Among the four major dimensions being considered here there are six unordered pairs. It is possible for all of these pairs to determine the order--which best predicts the other over time. Urbanization in 1950 is as good a predictor of structural differentiation in 1960 as is structural differentiation in 1950 a predictor of urbanization in 1960. Urbanization predicts enrollment ratios about as well as enrollment ratios predict urbanization.[1]

Communicability predicts structural differentiation about as well as structural differentiation predicts communicability. Communicability predicts enrollment ratios more strongly than enrollment ratios predict communicability. Structural differentiation predicts enrollment ratios more strongly than enrollment ratios predict structural differentiation.

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[1] The difference in predictive strength between these two dimensions is quite small. Using the urbanization measures available for both 1950 and 1960 the average Tau for urbanization 1950 with enrollment ratios 1960 is .39. For enrollment ratios 1950 with urbanization 1960 the average Tau is .34. C. Arnold Anderson, using a world-wide set of nations and a longer time span has found a much larger difference. National income in 1938 predicts 1955 primary enrollment much more strongly than 1930 enrollment predicts 1955 income. "Excluding those countries with virtually complete literacy, we find that these coefficients are .57 and .20 respectively [using r^2]. Moreover, the correlation of 1938 with 1955 incomes is .75 and the addition of 1930 primary enrollments raises it to only .77." C. Arnold Anderson, "Economic Development and Post-Primary Education," Post Primary Education and Political and Economic Development edited by Don C. Piper and Taylor Cole (Durham: Duke University Press, 1964), p. 4. The difference between Anerson's finding and the results reported here may indicate that if a longer time span were considered, urbanization would be found to be a much better predictor of enrollment ratios than vice versa. The difference may also be an artifact of the different statistics, data series, and nations used.

No evidence has as yet been presented concerning the relationship between urbanization and communicability over time. Table 28 presents the coefficients of rank association calculated to ascertain which of these two dimensions in 1950 best predicts the other in 1960. The two communicability measures available for 1950 and 1960 have been associated with four of the urbanization measures available for both dates. In every case 1950 urbanization is a better predictor of 1960 communicability than is communicability in 1950 a predictor of 1960 urbanization. Figure 2 portrays these relationships, the arrows indicating the direction in which the predictive strength is greatest. It should be remembered that each of these associations is to some extent reciprocal. The unidirectional arrows simply indicate that a relationship is much stronger in one direction than in the other.

Pulling together the major threads in the evidence thus far assembled a simple model has been constructed

TABLE 28

RANK ASSOCIATION OF SELECTED MEASURES OF URBANIZATION, WITH SELECTED MEASURES OF COMMUNICABILITY: LATIN AMERICA[a]

	Economic Flexibility 1950	Industrial diversity 1950	Economic Flexibility 1960	Industrial diversity 1960
GNP per capita 1950			.40	.39
GNP per capita 1960	.08	.18		
Percentage population urban 1950			.46	.63
Percentage population urban 1960 (in communities of 100,000 or more)	.43	.34		
Number of radio receivers per 1000 population 1950			.40	.47
Number of radio receivers per 1000 population 1960	.28	.20		
Percentage of GDP due to manufacturing 1950			.73	1.00
Percentage of GDP due to manufacturing 1960	.71	.86		

[a] For data sources, see Table 25.

Urbanization → Communicability

Urbanization ↔ Educational Structural Differentiation

Urbanization ↔ Enrollment ratio

Communicability ↔ Educational Structural Differentiation

Communicability → Enrollment ratio

Educational Structural Differentiation → Enrollment ratio

Fig. 2. Direction of association over time between four dimensions: Latin America.

depicting the interrelationships between the four dimensions. This model is presented in Figure 3. The arrows indicate direction of strongest effect over time. Solid lines indicate relatively strong associations. Broken lines indicate relatively weak associations.

The data used for this study, from which the model has been drawn, cannot of course be used further to test the model. However, through the use of the multiple association coefficient the adequacy of this model as a summary of the interrelationships evidenced in this body of data can be further demonstrated. For example, if the model is accurate, the simple association between urbanization at one point in time and structural differentiation at a later time ought to be considerably improved when the effect of communicability at an intermediate time is added. One would not, however, expect the relationship between communicability at one time and differentiation at a later time to be much improved when the effect of urbanization at an intermediate time is added. Data being available for

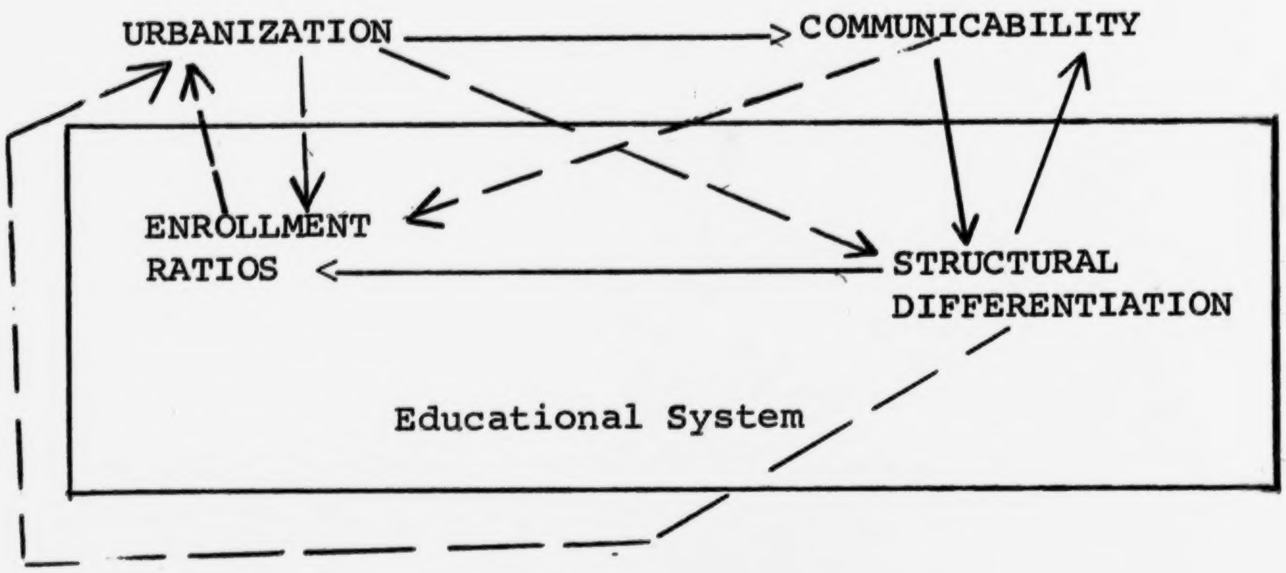
URBANIZATION
COMMUNICABILITY
ENROLLMENT RATIOS
STRUCTURAL DIFFERENTIATION
Educational System

Fig. 3. A model of some educational boundary-crossing relationships: Latin America

only two dates, 1950 and 1960, it is not possible to add in the effect of variables at an intermediate time. Rather the additional variables for each simple association are considered at both the earlier and later dates. Using the symbols introduced on page 179 the simple association A1, B2 is compared with the multiple associations (A1, C1)B2, (A1,C2)B2, (A1,D1)B2, and (A1,D2)B2; the simple association A1,C2 is compared with the multiple associations (A1,B1)C2, (A1,B2)C2, (A1,D1)C2, and (A1,D2)C2; and so on around the model.

The generalizations which summarize the results of these calculations are listed in Table 29. The supporting data are found in Appendix D. To give some idea of the extent of improvement in the simple associations when different variables are added the mean improvement and the range of improvement are also listed. For example, the mean difference between the simple association of urbanization 1950 with communicability 1960 and the multiple association of urbanization 1950 and differentiation 1950 or 1960 with communicability 1960 is .217. The differences range from .00 to .46.

TABLE 29

MEAN IMPROVEMENT AND RANGE OF IMPROVEMENTS OVER SIMPLE RANK ASSOCIATIONS BETWEEN URBANIZATION, COMMUNICABILITY, EDUCATIONAL STRUCTURAL DIFFERENTIATION AND ENROLLMENT RATIOS WHEN SPECIFIED MULTIPLE ASSOCIATIONS ARE CALCULATED: LATIN AMERICA[a]

	Improvement	
	Mean	Range
A. Urbanization 1950 with Communicability 1960		
1. Much improved when Differentiation added	.217	.00-.46
2. Not improved when Enrollment ratios added	.019	.00-.07
B. Urbanization 1950 with Differentiation 1960		
1. Much improved when Communicability added	.232	.01-.47
2. Not improved when enrollment ratios added	.035	.00-.12
C. Urbanization 1950 with Enrollment ratios 1960		
1. Slightly improved when Communicability added	.079	.00-.45
2. Improved when Differentiation added	.118	.00-.45
D. Communicability 1950 with Differentiation 1960		
1. Not improved when Enrollment ratios added	.010	.00-.02
2. Not improved when urbanization added	.040	.00-.14

TABLE 29--Continued

	Improvement	
	Mean	Range
E. Communicability 1950 with Enrollment ratios 1960		
1. Improved when Urbanization added	.141	.01-.36
2. Slightly improved when Differentiation added	.067	.00-.14
F. Communicability 1950 with Urbanization 1960		
1. Improved when Differentiation added	.116	.00-.28
2. Improved when Enrollment ratios added	.197	.05-.37
G. Differentiation 1950 with Enrollment ratios 1960		
1. Improved when Urbanization added	.110	.01-.25
2. Not improved when Communicability added	.011	.00-.07
H. Differentiation 1950 with Urbanization 1960		
1. Improved when Enrollment ratios added	.138	.03-.30
2. Not improved when Communicability added	.046	.00-.16
I. Differentiation 1950 with Communicability 1960		
1. Not improved when Enrollment ratios added	.00	.00-.00
2. Not improved when Urbanization added	.064	.00-.28

TABLE 29--Continued

	Improvement	
	Mean	Range
J. Enrollment ratio 1950 with Urbanization 1960		
1. Improved when Communicability added	.148	.00-.63
2. Improved when Differentiation added	.197	.00-.64
K. Enrollment ratio 1950 with Communicability 1960		
1. Improved when Urbanization added	.181	.00-.55
2. Much improved when Differentiation added	.479	.25-.59
L. Enrollment ratio 1950 with Differentiation 1960		
1. Much improved when Urbanization added	.253	.02-.57
2. Much improved when Communicability added	.471	.32-.56

[a] Supporting data: See Appendix D.

These results provide support for the model as a representation of the interrelationships among the four dimensions. Section E of Table 29 provides the only puzzle. The model suggests that the simple association between communicability 1950 and enrollment ratios 1960 ought to be substantially improved when structural differentiation is added and little improved when urbanization is added. The reverse is the case. Considering that the results fit the model in all the other cases, this may be an artifact of the particular variables chosen, or it may indicate that the variables not included in this analysis are particularly important in the one case. Or it may indicate that the model is not a completely adequate representation of all of the interrelationships considered. Sections J, K, and L illustrate the relatively weak predictive strength of enrollment ratios. No matter what is added to the simple associations noted in these three sections a substantial improvement in the coefficients results.

These multiple associations give added weight to the notion that educational structural differentiation is a dimension of considerable importance to the relationships between educational systems and their environments. A highly urbanized society in 1950 is likely to have relatively high enrollment ratios in 1960. A society which ranks relatively highly on urbanization measures in 1950 and also has a highly differentiated educational system, at either 1950 or 1960, is more likely to have relatively high enrollment ratios in 1960. A society with relatively high enrollment ratios in 1950 is somewhat likely to be relatively highly communicative in 1960. A society with relatively high enrollment ratios in 1950 and a highly differentiated educational system at either date is much more likely to rank relatively highly on communicability measures in 1960. This is the case to a greater or lesser extent for all of the simple associations considered.

Indeed, considering all of the simple associations to which differentiation has been added, the mean improvement over the simple association coefficients is .1728. This is higher than the average improvement produced among all the simple associations when urbanization or communicability are added (.1429 and .1335 respectively) and is more than twice as high as the mean improvement produced by adding enrollment ratios (.0815). The effect of differentiation on relationships between the two extra-educational dimensions, urbanization and communicability, is almost as great as its effect on the relationships which cross the boundaries of the educational system.

Using the systems perspective adopted in this work a total society can be viewed as a complexly interacting set of subsystems (e.g., educational system, economic system, political system, etc.) joined together by communicative links or channels, along which information relative to changes in one part of the system is transmitted to other parts. As these communicative links become more differentiated they are able to transmit or process a greater diversity of information, and the various subsystems are increasingly able to respond to one another. To establish a highly differentiated educational system is perhaps to establish a rather effective set of such communicative links, not only between the educational system and other systems, but between other systems themselves.

CHAPTER VII

SUMMARY AND IMPLICATIONS

A Brief Summary

In looking back over the preceding pages two general findings stand out. First, considering educational structural differentiation as a process, it tends to be evolutionary, though not in a strictly unilineal fashion. As was shown in Chapter IV, the general sequence of item acquisition appears to be approximated by the order of items on a scale. It is therefore possible to predict rather successfully over a short period of time the structural elements which systems will next acquire.

Second, educational structural differentiation, considered as a state, plays a very important role in the adaptation of educational systems to a wide range of environmental changes. With reference to the way in which education's contribution to development is typically phrased, it is of particular note that educational structural differentiation relates to most of the extra-educational variables considered here as well as or better than enrollment ratios.

Before considering some of the implications of these major findings each of the preceding chapters will be briefly reviewed. In Chapter I the systems analytic perspective guiding much of this work is briefly outlined, and structural differentiation is defined, both as a process and as a state. It is noted that within the systems perspective, structural differentiation is one of the key mechanisms by which systems map information concerning environmental change into themselves. It is thus a key dimension in understanding system adaptiveness ~~of~~ or lack thereof. Moreover, it is suggested that the level of structural differentiation in a system at any point in time is a good index of the ability of the system further to adapt.

Chapter II is concerned with methodology. The appropriateness of Guttman scalogram analysis as a technique to measure the structural differentiation of educational systems is indicated, and the mechanics of the technique are briefly described. The list of possible scale items used in this study is presented, and the universe of nations against which these items have been tested is noted. The chapter concludes with a discussion of the nature of the available cross-national data and the restrictions which are imposed by it on analytic techniques used.

In Chapter III the scales developed to measure educational structural differentiation in 1960 are presented. The first is a thirty-four item scale of structural differentiation among the educational systems of the nineteen autonomous Latin American nations. It was possible to generalize this scale, and the resulting twenty-two item, forty-nine nation scale is also found in Chapter III. Additionally, separate subscales of the structural differentiation of higher education, secondary education, agricultural education, and special education are reported. Among them, these four subscales pick up most of the few candidate items not fitting the full Latin American scale. Although there are some differences between the full scale and the subscales in the ranks assigned to nations, it is concluded that it is reasonable to consider the full scale as a measure of the structural differentiation of total educational systems in Latin America. Some of the information carried by the subscales is lost, but very little.

Chapter IV details the arguments and evidence leading to the conclusions listed in the first paragraph of this chapter. Two hypotheses are advanced. 1) The sequence of acquisition of structural elements in educational systems in Latin America has tended to follow the item ranking on the scale of educational structural differentiation for that area. 2) Given knowledge of the level of differentiation of an educational system at a particular point in time, it is possible to predict with better than 50 percent accuracy the structural elements which the system will next acquire. To evaluate the first hypothesis the actual dates of acquisition of scale items were found for the Latin American systems. Although the available data is far from complete, it does lend credence to the hypothesis. In order to test the second hypothesis a scale of educational structural differentiation for 1950 is presented, and compared with the 1960 Latin American scale. The second hypothesis receives very substantial support.

In Chapter V attention is given to cross-sectional correlations between variables within the boundaries of educational systems. The associations between structural differentiation, segmentation, and enrollment are particularly considered. Although, as one would expect, enrollment is very closely associated with segmentation, structural differentiation is also closely associated with it. Moreover, the two structural dimensions are more predictors of than predicted by enrollment, which represents a reversal of the way the relationships are often treated. A simple model depicting the relationships between these three dimensions is presented. Enrollment ratios are next considered. Structural differentiation is very weakly associated with such ratios. However, it is discovered that, at the secondary level, differentiation, when acting in concert with enrollment, is a fairly good predictor of enrollment ratios.

Relationships which cross the boundaries of educational systems are the particular focus of Chapter VI.

Within the educational system, structural differentiation and enrollment ratios are considered. The latter are of interest because they are the most widely used indicators of educational output in cross-national studies. Indeed, enrollment ratios are the only output-related data series available for many developing systems. Outside of the educational system two dimensions, urbanization and communicability, are examined. Urbanization is the term chosen to refer to whatever it is that is measured by such traditional "development" indicators as GNP per capita, commercial energy consumption, number of newspapers and telephones, etc., all of which have repeatedly been found to be highly interrelated. Communicability refers to the differentiation or information-processing capability of social systems other than the educational system. Using a large assemblage of data eight specific hypotheses concerning the relationships between structural differentiation, enrollment ratios, urbanization and communicability are tested. These eight are specifications of a broader two-part hypothesis which suggests that 1) structural differentiation relates highly to communicability and less highly to urbanization, and 2) enrollment ratios relate highly to urbanization and less highly to communicability.

As it turns out, educational structural differentiation is highly associated with communicability. However, such differentiation is almost as highly associated with urbanization. Moreover, although enrollment ratios are weakly associated with communicability, they are also not very highly associated with urbanization measures. The relationships found in this study between enrollment ratios and urbanization measures are lower, in some cases far lower, than those found in previous studies which have considered these same variables. It is suggested that previous studies have overestimated the association due to the interacting effects of the samples of societies they have dealt with and the statistic they have used.

With evidence available both for 1950 and 1960 a simple model of the relationships between the four major dimensions--educational structural differentiation, enrollment ratios, communicability and urbanization--over time is developed. By calculating the multiple associations among the four dimensions over time the adequacy of the model is demonstrated. Educational structural differentiation is found to play a very strategic role in educational system adaptiveness, not only standing alone, but in conjunction with the other three dimensions.

Some Implications

Because it has followed a strategy which is oriented toward theory-building, the results of this study may be thought to be of primary interest to the theorist whose attention is directed toward an explanation of education-development relationships. But this study may have something to say to the planner as well.[1]

The work reported in Chapter IV, concerned with structural differentiation as a process, is perhaps of most direct interest to the planner. A scale of educational structural differentiation may be thought of as providing a codification and organization of experience. It indicates the approximate sequence in which structural elements have been acquired and permits fairly successful prediction as to which structural elements systems will next acquire, at least over the short run. It is not claimed that the experience of other nations in the past is an infallible guide to the actions which a nation should take in the future. And it should be remembered that the fit between scale sequence and chronological sequence of item acquisition is not perfect. Particularly it must be stressed that unforeseen technological or social changes may dramatically affect the "importance" of certain structural elements, and render some parts of the experience meaningless.[1]

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[1] Planning and theory-building are not presumed to be necessarily mutually exclusive, although individuals tend to concentrate their efforts on one or the other activity. It is to be hoped that educational planning (at least that planning which is more than an elaborate rationalization and projection of the status quo and status quo ante) is solidly founded in what we do know about the relationships between education and other social systems. To the extent that theory-building is an attempt to systematize and simplify such knowledge, it ought to be an important input into the planning process.

But to suggest that a scale is not an infallible guide to future action is not to say that it should be ignored. To say this would be to claim that others' experience is completely irrelevant. For example, if planners in a Latin American nation whose most advanced scale item is a university-level teacher training institution are considering establishing a faculty of Sociology or a graduate faculty, they should at least be aware that almost every other system in which these items have been instituted has a whole series of intervening items. It may be decided to go ahead anyway (as happened, intentionally or not, in Costa Rica), but planners should at least know that they are flying in the face of experience when they choose to do so.

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[1] This is, of course, a problem endemic to all sorts of planning. The unforeseen or unforeseeable may make even the most carefully drawn and sophisticated plan irrelevant.

In Chapters V and VI relationships within educational systems and across system boundaries are separately considered. Two separate models are advanced. By combining the two models a more complete picture of the interrelationships between the several dimensions considered in the two chapters may be developed. In Figure 4 is depicted one model which appears to summarize much of the information contained in Chapters V and VI. The solid arrows indicate relatively high associations over time. The broken arrows indicate relatively weak associations over time. The adequacy of this model has not been completely tested. However, a very useful next step beyond the present analysis would be to test this combined model in the same fashion as the model presented in the

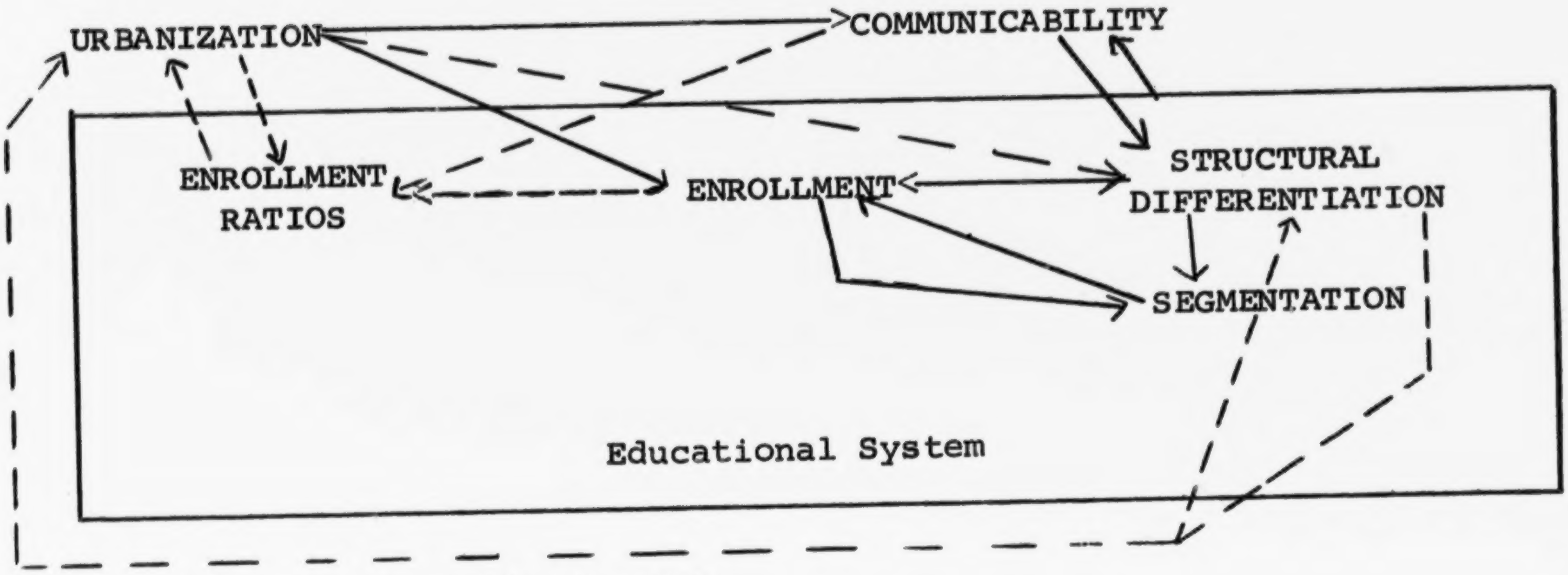
URBANIZATION
COMMUNICABILITY
ENROLLMENT RATIOS
ENROLLMENT
STRUCTURAL DIFFERENTIATION
SEGMENTATION
Educational System

Fig. 4. A combined model.

preceding chapter has been tested, using multiple association coefficients. Given the complexity of the model, this testing would necessitate some very careful hypothesizing and an awesome amount of calculation, but the necessary measures of each of the dimensions for at least two points in time are available. To the extent that Figure 4 accurately depicts the interrelationships among the several dimensions included, it shows quite clearly the importance of structural differentiation in both within-system and boundary crossing relationships.

This study suggests several other directions which additional work might usefully take. It would, for example, be helpful to determine what penalties are attached to scale error--to determine what consequences may follow from a decision to establish structural elements in a sequence radically different from that followed by other systems. A number of presumably important variables have been excluded from consideration here, for lack of data or for lack of appropriate measurement techniques. Understanding would be considerably improved if better measures of educational system output could be developed and if some way of measuring the communicative links which bind the various structural elements together, and which connect them with the environment, could be devised.

The last-mentioned measure would be particularly useful in examining a problem which has not been considered, that of over-differentiation. As a system adds new types of structural elements, it is faced with the problem of integrating them into the system. New communicative links must be established and old links must be altered.[1] Without the establishment of such links, structural differentiation can lead to increasing fragmentation and parochialization, and perhaps be an impediment to the adaptability of the system. Lacking a measure (or measures) of system organization, consideration of this matter must remain ideosyncratic and speculative.

In addition to gathering data and developing measures so as to plug in additional dimensions, it would be most helpful to acquire information sufficient to extend this analysis over a longer period of time, expanding it beyond the two dates to which it is now limited. This would allow a systematic consideration of feedback relationships and permit more direct evaluation of the combined model just presented.

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[1] Parsons has noted that "differentiation processes . . . pose new problems of *integration* for the system. The operations of two (or more) categories of structural units must be coordinated where only one category existed before." Parsons, *Societies: Evolutionary and Comparative Perspectives*, p. 23. Cf. also Coleman, *Education and Political Development*, p. 15.

Particularly helpful in expanding the analysis presented in Chapter IV would be the development of a scale of educational structural differentiation in Latin America representing the present, or as near the present as possible. Additionally, a more extensive data search might make it possible to date the acquisition of a greater proportion of the scale items. This would provide a less sketchy test of the "sequence" hypothesis advanced in that chapter.

Complementing these extensions of the cross-national approach used here, a series of historical case-studies would be quite useful. Such studies could attempt to isolate the events leading to the establishment of various structural elements in different systems. They might be particularly helpful in unravelling the interrelationships between structural elements, in explaining why certain elements tend to precede or follow others.

In addition to the substantive contributions this study may have made, it appears to have relevance to some of the problems of methodology in the comparative study of education. It has first of all demonstrated the use of a measurement technique, Guttman scalogram analysis, which may have utility for the study of educational system dimensions other than structural differentiation. It might be possible, for example, to develop a scale (or scales) of educational system performance characteristics, perhaps using, among others, some of the items rejected from the present study because they appear to reflect performance rather than structural differentiation (see Chapter II).

One of the particular advantages of scalogram analysis is its demonstration of unidimensionality. As Winch and Freeman have noted, a scale provides a typology "with a single empirical referent."[1] This brings one to another methodological contribution of this study. It is noted in Chapter I that the author regards as the primary purpose of comparative studies the generalization and specification of propositions--statements of relation between variables. But to fulfill this purpose it is necessary to have typologies with single identified referents. That is, it does little good to discover that the relation between variables x and y differs, or is the same, in systems of types A and B, if one is not clear as to how, precisely, types A and B are themselves different. As is noted in Chapter III, one of the difficulties with often-used regional typologies relates to this point. It is not particularly informative to note that two variables are related in one fashion in Latin America, say, and another fashion in sub-Saharan Africa, because one does not know precisely in what respects the two regions differ, or are similar. That is, a proposition, one of whose terms has a very unclear empirical referent, carries very little information.

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[1] Winch and Freeman, p. 642.

It is suggested that it may prove very helpful in attempting to understand how educational systems relate to other social systems, and to understand how the various dimensions of educational systems interrelate, to order the information which has been accumulated concerning relations within educational systems and across system boundaries according to the level of structural differentiation of the educational systems. One would not want to stop after such an exercise, of course, as there are a variety of other dimensions (system performance should be particularly interesting) which could also be controlled. But educational structural differentiation can be a good place to begin the attempt to develop statements of generalization and specification. It is not only subject to unidimensional measurement, but, as this study has also demonstrated, it is a dimension of both empirical and theoretical importance to understanding the ability of educational systems to adapt to changes in their environments.

APPENDICES

APPENDIX A
SUPPORTING SCALES

SCALOGRAM OF COMMUNICABILITY FOR THE NINETEEN AUTONOMOUS LATIN AMERICAN NATIONS[a]

C.R. = .95 C.S. = .78	Functioning political parties 1963	Unions not controlled	Free domestic press	Wholly elective legislature 1963	Elective functioning legislature 1963	No dictator nor counter-rev.	Supreme court justices	Federalism	Right to strike	Frequent strikes
Paraguay	O	O	O	O	O	O	O	O	O	O
Haiti	O	O	O	X	O	O	O	O	O	O
Dominican Republic	-*	O	O	O	-	O	O	O	O	O
Venezuela	O	O	O	O	O	X	O	X	O	O
Guatemala	X	X	-	O	O	O	O	O	O	O
Honduras	X	X	-	X	X	O	O	O	O	O
Ecuador	O	X	X	X	X	O	O	O	O	O
Colombia	X	X	X	X	O	X	O	O	O	O
El Salvador	X	X	X	X	X	X	O	O	O	O
Costa Rica	X	X	X	X	X	X	O	O	O	O
Panama	X	X	X	X	X	X	O	O	O	O
Bolivia	X	X	X	X	X	X	O	O	O	-
Chile	X	X	X	X	X	X	X	O	O	X
Nicaragua	X	X	-	X	X	X	X	O	O	O
Brazil	X	X	X	X	X	O	X	X	O	O
Peru	X	X	X	X	X	X	X	O	X	X
Uruguay	X	X	X	X	X	X	X	X	X	X
Mexico	X	X	X	X	X	X	X	X	X	X
Argentina	X	X	X	X	O	X	X	X	O	X

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[a] Source. Ruth Young, *Some Dimensions of Development: A Cross-National Study* (unpublished MS, Department of Rural Sociology, Cornell University, 1966), p. 39.

*Dashes indicate that information is missing.

A GUTTMAN SCALE OF NATIONAL COMMUNICABILITY FOR THE NINETEEN AUTONOMOUS LATIN AMERICAN NATIONS[a]

Step No.	Item	Proportion Having Item	Error
1.	There were functioning political parties as of 1963	.79	1
	Unions are not controlled by the government		0
2.	There is a free domestic press	.74	0
	There was a wholly elective legislature in 1963		1
	There is a wholly elective functioning legislature, 1963		2
3.	There is no dictator form of government, nor has there been a conservative counter-revolution with suppresion of the legislature, and elections in 1963-64.	.58	2
4.	There are Supreme Court Justices elected or appointed for life	.37	0
5.	The national has a federal form of government	.26	2
6.	There is an unlimited right to strike	.16	1
	There are frequent strikes		2

[a] Source. Ruth Young, p. 38.

SCALOGRAM OF ECONOMIC INSTITUTIONAL FLEXIBILITY FOR THE NINETEEN AUTONOMOUS LATIN AMERICAN NATIONS[a]

C.R. = .98 C.S. = .71	Central Banks Organization	Free trade or common mark.	Exports manufactured goods	Chamber of Commerce	L.A. Council Oceanography	Intern. Scientific Council	Free Trade Association	Public Stock Exchange	Internat. Union of Testing	Iron and Steel Institute	Metal and other exports	Intern. Org. Standardizat.	Buildings and Public Works	Metals & machinery exports	Chamber Commerce	Cooperatives	Income & Wealth Organiza.	Large Electrical Systems	Insurance &Reinsurance	Physics Unions	Business & Prof. Women Cl.
Dominican Rep.	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Haiti	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Panama	O	O	O	O	O	O	O	X	O	O	O	O	O	O	O	O	O	O	O	O	O
Bolivia	X	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O	X	O
Paraguay	X	X	O	O	O	O	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Nicaragua	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Guatemala	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
El Salvador	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Honduras	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Ecuador	X	O	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Costa Rica	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Uruguay	X	X	X	X	X	X	X	X	X	O	O	O	O	O	X	O	X	O	O	O	O
Venezuela	X	O	X	X	X	X	O	X	X	X	X	X	X	O	O	X	O	O	X	O	O
Peru	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	O	O	O
Chile	X	X	X	X	X	X	X	X	X	X	X	O	X	O	O	X	X	X	O	O	O
Colombia	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	O	O	O
Brazil	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	O
Mexico	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X
Argentina	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

[a] Source. Ruth Young, p. 57.

A GUTTMAN SCALE OF ECONOMIC INSTITUTIONAL FLEXIBILITY FOR THE NINETEEN AUTONOMOUS LATIN AMERICAN NATIONS[a]

Step No.	Item	Proportion Having Item	Error
1.	Nation has unit of Central Banks Org.	.84	0
2.	Nation belongs to Free Trade Association or Central American Common Market	.68	2
3.	Nation exports any manufactured goods	.74	0
4.	Nation has any type of Chamber of Commerce unit	.63	0
5.	Nation has unit of Latin American Council on Oceanography	.47	0
6.	Nation has unit of International Scientific Council	.42	0
	Nation belongs to Free Trade Assoc.		2
	Nation has public stock exchange		2
	Nation has unit of International Union of Testing and Research Laboratories for Materials and Structures		1
7.	Nation belongs to Latin American Iron and Steel Institute	.37	1
	Nation exports manufactured metals and some other export as well		1
	Nation has unit of International Organization for Standardization		1
	Nation has unit of Organization for Buildings and Public Works		2
8.	Nation exports both manufactured metals and machinery	.32	1
	Nation has national unit of Chamber of Commerce		1
9.	Nation has national unit of Cooperatives	.26	1
	Nation has unit of Organization for Research on Income and Wealth		2
	Nation belongs to Conference on Large Electrical Systems		1
10.	Nation has unit of Insurance and Reinsurance Brokers	.21	1
	Nation has unit of Physics Union		1
11.	Nation has unit of Business and Professional Women's Club	.10	0

[a] Source. Ruth Young, p. 56.

SCALOGRAM OF INDUSTRIAL DIVERSITY FOR THE NINETEEN AUTONOMOUS LATIN AMERICAN NATIONS[a]

	Cement	Petroleum refinery	Wool yarn	Steel	Man-made yarn	Aircraft	Motor vehicles	Locomotives
Honduras	O	O	O	O	O	O	O	O
Costa Rica	O	O	O	O	O	O	O	O
Paraguay	X	O	O	O	O	O	O	O
Dominican Republic	X	O	O	O	O	O	O	O
Haiti	X	O	O	O	O	O	O	O
Nicaragua	X	O	O	O	O	O	O	O
Panama	X	X	O	O	O	O	O	O
Bolivia	X	X	O	O	O	O	O	O
El Salvador	X	X	O	O	O	O	O	O
Guatemala	X	X	O	O	O	O	O	O
Ecuador	X	X	O	O	O	O	O	O
Colombia	X	X	X	X	X	O	O	O
Peru	X	X	X	X	X	O	O	O
Uruguay	X	X	X	O	X	O	O	O
Venezuela	X	X	O	X	X	X	X	O
Mexico	X	X	X	X	X	X	X	O
Brazil	X	X	X	X	X	X	X	O
Chile	X	X	X	X	X	X	X	O
Argentina	X	X	X	X	X	X	X	O

[a] Adapted from Ruth Young, p. 60.

A GUTTMAN SCALE OF INDUSTRIAL DIVERSITY FOR THE NINETEEN AUTONOMOUS LATIN AMERICAN NATIONS[a]

Item	Proportion Having Item	Error
Nation manufactures cement	.89	0
Nation has a petroleum refinery	.68	0
Nation manufactures wool yarn	.37	1
Nation manufactures steel	.37	1
Nation manufactures man-made yarn	.42	0
Nation manufactures aircraft	.26	0
Nation manufactures motor vehicles	.26	0
Nation manufactures locomotives	.00	-

[a] Adapted from Ruth Young, p. 59.

SCALOGRAM OF AREAS OF COVERAGE OF SOCIAL SECURITY PROGRAMS LATIN AMERICA[a]

C.R. = .97 C.S. = .87 C.R. using only items with -80% marginals .97	Work accidents	Maternity	Sickness	Death	Invalidism	Old age insurance	Family subsidies	Unemployment
Haiti	X	O	O	O	O	O	O	O
El Salvador	X	X	X	O	O	O	O	O
Guatemala	X	X	X	O	O	O	O	O
Honduras	X	X	X	O	O	O	O	O
Venezuela	X	X	X	O	O	O	O	O
Colombia	X	X	X	O	O	O	X	O
Mexico	X	X	X	X	X	X	O	O
Nicaragua	X	X	X	X	X	X	O	O
Panama	X	X	X	X	X	X	O	O
Paraguay	X	X	X	X	X	X	O	O
Peru	X	X	X	X	X	X	O	O
Dominican Republic	X	X	X	X	X	X	O	O
Argentina	X	X	O	X	X	X	X	O
Bolivia	X	X	X	X	X	X	X	O
Brazil	X	X	X	X	X	X	X	O
Costa Rica	X	X	X	X	X	X	X	O
Ecuador	X	X	X	X	X	X	O	X
Uruguay	X	X	O	X	X	X	X	X
Chile	X	X	X	X	X	X	X	X

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[a] All data from Union Panamericana, Estudio social de America Latina 1963-1964 (Washington, D. C.: 1964), cuadro 63, p. 158.

SCALE OF AREAS OF COVERAGE OF LATIN AMERICAN SOCIAL SECURITY PROGRAMS

Step No.	Item	Proportion Having Item	Error
1.*	Nation has program covering work accidents	1.00	-
2.	Nation has program covering maternity	.95	
	Nation has program covering sickness	.84	1
3.	Nation has program covering death	.68	0
	Nation has program covering invalidism	.68	0
	Nation has program covering old age	.68	0
4.	Nation has program of family subsidies	.37	2
5.	Nation has program of unemployment insurance	.16	0

* The item in Step 1 is not properly part of the scale, being present in all nineteen nations. It is included to give a complete picture, but is not used in computing coefficients of reproducibility or scalability.

SCALOGRAM OF ECONOMIC INSTITUTIONAL FLEXIBILITY
LATIN AMERICA 1950

C.R. = .96
C.S. = .78
C.R. using only items with -80% marginals .96

	No discrimination against foreign patent applicants	Member Pan Amer. Union Tech. Experts in field of Econ. Sci.	Foreign Bureau of World News Agency	Member South Amer. Petroleum Inst.	Exports any manufactured goods	Foreign Bureau of both U. S. and European News Agency	Member International Council of Scientific Unions	Exports manufactured metals and some other export	National unit International Chamber of Commerce	Member International Office for Weights and Measures	Member International Organization for Standardization	National News Agency	Member International Society of Soil Sciences
El Salvador	O	O	O	O	O	O	O	O	O	O	O	O	O
Haiti	X	O	O	O	O	O	O	O	O	O	O	O	O
Dominican Republic	X	O	O	O	O	O	O	O	O	O	O	O	O
Nicaragua	X	O	O	O	O	O	O	O	O	O	O	O	O
Honduras	X	O	O	O	O	O	O	O	O	O	O	O	O
Costa Rica	X	O	O	O	O	O	O	O	O	O	O	O	O
Panama	X	X	O	O	O	O	O	O	O	O	O	O	O
Guatemala	X	X	O	O	O	O	O	O	O	O	O	O	O
Paraguay	X	X	X	O	O	O	O	O	O	O	O	O	O
Colombia	X	X	X	O	O	O	O	O	O	O	O	O	O
Bolivia	X	X	X	X	O	O	O	O	O	O	O	O	O
Ecuador	X	X	X	X	O	O	O	O	O	O	O	O	O
Venezuela	X	O	X	O	X	X	O	O	O	O	O	X	O
Peru	X	X	X	X	X	X	X	X	X	X	O	O	O
Mexico	X	X	X	O	X	X	X	X	X	X	X	O	O
Chile	X	X	X	X	X	X	X	X	O	X	X	X	O
Uruguay	X	X	X	X	X	X	X	O	X	X	X	X	O
Brazil	X	X	X	X	X	X	X	X	X	O	X	X	O
Argnetina	X	X	X	X	X	X	X	X	X	X	O	X	X

SCALE OF ECONOMIC INSTITUTIONAL FLEXIBILITY LATIN AMERICA 1950[a]

Step No.	Item	Proportion Having Item	Error
1.	No legal discrimination against foreign patent applicants	.95	0
2.	Member of Pan American Union of Technical Experts in the Field of Economic Sciences	.63	1
3.	Bureau of any world news agency	.58	0
4.	Member of South American Petroleum Institute	.37	2
5.	Exports any manufactured goods	.37	0
	Bureau of both U. S. and European new agencies	.37	0
6.	Member of International Council of Scientific Unions	.32	0
	Exports manufactured metal and some other export	.26	1
	National unit of International Chamber of Commerce	.26	1
	Member of International Office for Weights and Measures	.26	1
7.	Member of International Organization for Standardization	.21	1
8.	National news agency	.26	0
9.	Member of International Society of Soil Sciences	.05	0

C.R. = .96
C.S. = .78

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[a] Sources: Patent laws: United Nations, *The Role of Patents in the Transfer of Technology to Developing Countries* (New York: 1964); New agencies: Unesco, *World Communication: Press, Radio, Film, Television* (3d ed.; Paris: 1956); Exports: *Oxford Economic Atlas of the World* (Oxford: Oxford University Press, 1954); all others: Union of International Associations, *Yearbook of International Organizations 1950* (New York: Hafner Publishing Company, 1950).

SCALOGRAM OF INDUSTRIAL DIVERSITY
LATIN AMERICA 1950

C.R. = .95 C.S. = .72 C.R. using only items with -80% marginals .95	Manufactures Cement	Has Petroleum Refinery	Manufactures Cotton Yarn or Fabric	Manufactures Boots and Shoes	Manufactures man-made Yarn or Fabr	Manufactures any non-ferrous metal	Manufactures steel	Manufactures Wool Yarn
Haiti	O	O	O	O	O	O	O	O
Panama	O	O	O	O	O	O	O	O
Paraguay	O	O	O	O	O	O	O	O
Nicaragua	O	O	O	O	O	O	O	O
Honduras	O	O	O	O	O	O	O	O
Costa Rica	O	O	O	O	O	O	O	O
El Salvador	O	O	X	O	O	O	O	O
Dominican Republic	X	O	O	X	O	O	O	O
Guatemala	X	O	O	O	O	X	O	O
Uruguay	X	X	O	O	O	O	O	O
Bolivia	O	X	X	X	O	O	X	O
Ecuador	X	X	X	X	X	O	O	O
Peru	X	X	X	X	X	X	O	O
Venezuela	X	X	X	X	X	X	O	O
Colombia	X	X	X	X	X	X	O	O
Mexico	X	X	X	X	X	X	X	O
Brazil	X	O	X	X	X	X	X	O
Argentina	X	X	X	X	X	X	X	O
Chile	X	O	X	X	X	X	X	X

SCALE OF INDUSTRIAL DIVERSITY
LATIN AMERICA 1950[a]

Step No.	Item	Proportion Having Item	Error
1.	Nation manufactures cement	.58	1
2.	Nation has petroleum refinery	.42	2
3.	Nation manufactures cotton yarn or fabric	.53	1
4.	Nation manufactures boots and shoes	.53	1
5.	Nation manufactures man-made yarn or fabric	.42	0
6.	Nation manufactures any non-ferrous metal	.42	1
7.	Nation manufactures steel	.26	1
8.	Nation manufactures wool yarn	.05	0

C.R. = .95
C.S. = .72

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[a] All data from Oxford Economic Atlas of the World (Oxford: Oxford University Press, 1954).

APPENDIX B

SOURCES OF DATA FOR SCALES OF EDUCATIONAL STRUCTURAL DIFFERENTIATION

General Sources

Victor M. Ardon, *La educacion industrial en Centro America*, Instituto de Investigaciones y Mejoramiento Educativo, Estudios de la Educacion Media en Centro America (Ciudad Universitaria, Guatemala, 1965).

"Aspectos de la educacion tecnica en America," *La educacion* (Union Panamericana), VII (Julio-Septiembre, 1957).

Ernesto F. Babino, *Estudio comparado de la educacion tecnica en America Latina*, Union Panamericana (Washington: 1963).

O. J. Bardeci y F. Escondrillas, *Financiamiento de la educacion en America Latina*, Union Panamericana (Washington: 1963).

Harold R. W. Benjamin, *Higher Education in the American Republics* (New York: McGraw Hill Book Co., Inc., 1965).

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APPENDIX C

SOURCES OF DATA FOR TABLE 26

Measures of Communicability

Young scale of communicability 1960.
See Appendix A.

Young scale of economic flexibility 1960.
See Appendix A.

Young scale of industrial diversity 1960.
See Appendix A.

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Phillips Cutright, "National Political Development: Measurement and Analysis," *American Sociological Review*, XXVIII, No. 2 (1963), 255.

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Gabriel Almond and James S. Coleman, The Politics of the Developing Areas (Princeton: Princeton University Press, 1960), p. 535.

Scale of economic flexibility 1950
See Appendix A.

Scale of industrial diversity 1950
See Appendix A.

Percentage of population White*
International Labour Office, Indigenous Peoples, Living and Working Conditions of Aboriginal Population in Independent Countries (Geneva: 1953), Chapter II.

Percentage of population Indian
Union Panamericana, Estudio Economico y Social de America Latina, 1961, Segunda Parte, Aspectos Sociales, Volumen II, Cuadros y Figuras (Washington: 1963), 260.

Measures of Urbanization 1960

Telephones per capita*
United Nations, Statistical Yearbook 1963 (New York 1963), Tables 2 and 158.

Per capita consumption of commercial energy*
United Nations, Statistical Yearbook 1964 (New York: (1964), Table 131.

Average rate of urbanization 1945-1955*
Economic Bulletin for Latin America, II (February, 1957), 16.

GNP per capita*
Bruce M. Russett et al., World Handbook of Political and Social Indicators (New Haven: Yale University Press, 1964), Table 44.

Percentage of population economically active
Statistical Abstract of Latin America 1965 (9th ed. Los Angeles: University of California Center of Latin American Studies, 1966), Table 34.

Percentage of population in communities of 2,500 or more*
ECLA, Economic Development in Latin America in the Post-War Period, II (Washington: 1960), 144.

Percentage of population in communities of 100,000 or more
Statistical Abstract of Latin America 1965, Table 8.

Electricity generation kwh per capita*
Norton Ginsburg, Atlas of Economic Development (Chicago: University of Chicago Press, 1961), Table 38.

Industrial employment as a percentage of urban population*
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Rate growth of imports*
ECLA, Economic Development of Latin America in the Post-War Period, II, 49-59.

Percentage of GDP due to manufacturing
Union Panamericana, Estudio Social de America Latina 1962 (Washington: 1964), Cuadro 52, p. 73.

Proportion of population over 15 years illiterate*
United Nations, Statistical Yearbook 1963 (New York: 1963), Table 5.

Newspaper circulation per 1,000 population*
Statistical Abstract of Latin America 1962 (6th ed. University of California Center of Latin American Studies, 1963), Table 19.

Kilograms of newsprint consumption per capita*
Ibid.

Number of radio transmitters
Unesco, Statistics on Radio and Television: 1950-1960 (Paris: 1963), Table 1.

Number of radio receivers per 1,000 population
Ibid., Table 2.

International mailflow*
Ginsburg, Table 44.

Number of motor vehicles per 1,000 population*
Statistical Abstract of Latin America 1962, Table 79.

Road density km. per 1,000 square miles*
Ibid., Table 81.

Rail density km. per 1,000 square miles*
Ibid., Table 82.

Social security coverage scale
See Appendix A.

Calories consumed per day per capita*
U. S. Congress, Joint Economic Committee, Subcommittee on Foreign Economic Policy, Food and People, 87th Congress, First Session, 1961, p. 7271.

Proteins consumed per day per capita*
Ibid.

Hospital beds per capita*
Statistical Abstract of Latin America 1962, Table 15.

Percentage of urban population served by piped water 1958-1961*
Union Panamericana, America en Cifras: 1963, VII, Estudios Sociales y Del Trabajo (Washington: 1963), 3.

Persons per physician*
Statistical Abstract of Latin America 1962, Table 15.

Infant mortality rate
Union Panamericana, Estudio Social de America Latina 1963-1964 (Washington: 1964) Cuadro 5, p. 15.

Gross mortality rate
Union Panamericana, Estudio Social de America Latina, 1962, Cuadro 15, p. 27.

Measures of Urbanization 1950

Average rate of urbanization pre-1950 intercensal period (communities of 20,000 or more)
Union Panamericana, Estudio Economico y Social de America Latina, 1961, Segunda Parte, Aspectos Sociales, II Cuadros y Figuras, 289.

GNP per capita
Ibid., p. 229.

Percentage of population economically active
Ibid., p. 235.

Percentage of population in communities of 20,000 or more
Ibid., p. 229.

Percentage of GDP due to manufacturing
Union Panamericana, Estudio Social de America Latina 1962, p. 73.

Percentage of population over 15 illiterate
Union Panamericana, Estudio Economico y Social de America Latina, 1961, Segunda Parte, Aspectos Sociales, II, Cuadros y Figuras, 229.

Combined index of economic development
Ibid.

Number of radio transmitters
Unesco, Statistics on Radio and Television, 1950-1960, Table 1.

Number of radio receivers per 1,000 population
Ibid., Table 2.

Infant mortality rate
Union Panamericana, Estudio Social de America Latina 1962, Cuadro 15.

Gross mortality rate
Ibid.

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*Data collected and supplied by Dr. Ruth Young, Cornell University. Citations refer to original source of data.

APPENDIX D

SUPPORTING DATA FOR TABLE 30

Simple and multiple associations between educational structural differentiation, 1950 and 1960, enrollment ratios, 1950 and 1960, selected measures of communicability, 1950 and 1960, and selected measures of urbanization, 1950 and 1960.[a]

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[a] The two communicability measures used in this exercise are the only two available for both dates. The urbanization measures used, selected from among the few available for both dates, were chosen to be as representative as possible. For data sources see Table 26.

	Associations	
	Multiple	Simple
A1		
GNP per capita 1950 with economic flexibility 1960		.40
adding structural differentiation 1950	.55	
adding structural differentiation 1960	.65	
GNP per capita 1950 with industrial diversity 1960		.39
adding structural differentiation 1950	.85	
adding structural differentiation 1960	.82	
% GDP due to manufacturing 1950 with economic flexibility 1960		.73
adding structural differentiation 1950	.73	
adding structural differentiation 1960	.73	
% population urban 1950 with industrial diversity 1960		.63
adding structural differentiation 1950	.85	
adding structural differentiation 1960	.91	
Number of radio receivers per 1,000 population 1950 with economic flexibility 1960		.40
adding structural differentiation 1950	.53	
adding structural differentiation 1960	.65	
A2		
GNP per capita 1950 with economic flexibility 1960		.40
adding primary enrollment ratio 1960	.41	
adding secondary enrollment ratio 1960	.41	
adding higher enrollment ratio 1960	.44	
GNP per capita 1950 with industrial diversity 1960		.39
adding primary enrollment ratio 1960	.44	
adding secondary enrollment ratio 1960	.46	
adding higher enrollment ratio 1960	.46	
% GDP due to manufacturing 1950 with economic flexibility 1960		.73
adding primary enrollment ratio 1960	.76	
adding secondary enrollment ratio 1960	.75	
adding higher enrollment ratio 1960	.75	

	Associations	
	Multiple	Simple
A2		
% population urban 1950 with industrial diversity 1960		.63
adding primary enrollment ratio 1960	.63	
adding secondary enrollment ratio 1960	.63	
adding higher enrollment ratio 1960	.59	
Number of radio receivers per 1,000 population 1950 with economic flexibility 1960		.40
adding primary enrollment ratio 1960	.39	
adding secondary enrollment ratio 1960	.41	
adding higher enrollment ratio 1960	.41	
B1		
GNP per capita 1950 with structural differentiation 1960		.35
adding economic flexibility 1950	.70	
adding economic flexibility 1960	.65	
adding industrial diversity 1950	.77	
adding industrial diversity 1960	.82	
% GDP due to manufacturing 1950 with structural differentiation 1960		.74
adding economic flexibility 1950	.83	
adding economic flexibility 1960	.75	
% population urban 1950 with structural differentiation 1960		.70
adding industrial diversity 1950	.82	
adding industrial diversity 1960	.86	
Number of radio receivers per 1,000 population 1950 with structural differentiation 1960		.49
adding economic flexibility 1950	.71	
adding economic flexibility 1960	.69	
B2		
GNP per capita 1950 with structural differentiation 1960		.35
adding primary enrollment ratio 1960	.44	
adding secondary enrollment ratio 1960	.47	
adding higher enrollment ratio 1960	.41	

	Associations	
B2	Multiple	Simple
% GDP due to manufacturing 1950 with structural differentiation 1960		.74
adding primary enrollment ratio 1960	.79	
adding secondary enrollment ratio 1960	.81	
adding higher enrollment ratio 1960	.70	
% population urban 1950 with structural differentiation 1960		.70
adding primary enrollment ratio 1960	.70	
adding secondary enrollment ratio 1960	.70	
adding higher enrollment ratio 1960	.70	
Number of radio receivers per 1,000 population 1950 with structural differentiation 1960		.49
adding primary enrollment ratio 1960	.50	
adding secondary enrollment ratio 1960	.50	
adding higher enrollment ratio 1960	.49	
C1		
GNP per capita 1950 with primary enrollment ratio 1960		.32
adding economic flexibility 1950	.46	
adding economic flexibility 1960	.32	
adding industrial diversity 1950	.35	
adding industrial diversity 1960	.37	
GNP per capita 1950 with secondary enrollment ratio 1960		.54
adding economic flexibility 1950	.62	
adding economic flexibility 1960	.55	
adding industrial diversity 1950	.58	
adding industrial diversity 1960	.58	
GNP per capita 1950 with higher enrollment ratio 1960		.37
adding economic flexibility 1950	.70	
adding economic flexibility 1960	.41	
adding industrial diversity 1950	.45	
adding industrial diversity 1960	.45	
Percentage GDP due to manufacturing 1950 with primary enrollment ratio 1960		.12
adding economic flexibility 1950	.57	
adding economic flexibility 1960	.23	

	Associations	
C1	Multiple	Simple
Percentage GDP due to manufacturing 1950 with secondary enrollment ratio 1960		.18
adding economic flexibility 1950	.54	
adding economic flexibility 1960	.27	
Percentage GDP due to manufacturing 1950 with higher enrollment ratio 1960		.32
adding economic flexibility 1950	.62	
adding economic flexibility 1960	.35	
Percentage population urban 1950 with primary enrollment ratio 1960		.49
adding industrial diversity 1950	.49	
adding industrial diversity 1960	.50	
Percentage population urban 1950 with secondary enrollment ratio 1960		.55
adding industrial diversity 1950	.57	
adding industrial diversity 1960	.57	
Percentage population urban 1950 with higher enrollment ratio 1960		.52
adding industrial diversity 1950	.52	
adding industrial diversity 1960	.52	
Number of radio receivers per 1,000 population 1950 with primary enrollment ratio 1960		.60
adding economic flexibility 1950	.61	
adding economic flexibility 1960	.60	
Number of radio receivers per 1,000 population 1950 with secondary enrollment ratio 1960		.58
adding economic flexibility 1950	.61	
adding economic flexibility 1960	.58	
Number of radio receivers per 1,000 population 1950 with higher enrollment ratio 1960		.64
adding economic flexibility 1950	.66	
adding economic flexibility 1960	.65	

	Associations	
C2	Multiple	Simple
GNP per capita 1950 with primary enrollment ratio 1960		.32
adding structural differentiation 1950	.44	
adding structural differentiation 1960	.42	
GNP per capita 1950 with secondary enrollment ratio 1960		.54
adding structural differentiation 1950	.73	
adding structural differentiation 1960	.61	
GNP per capita 1950 with higher enrollment ratio 1960		.37
adding structural differentiation 1950	.53	
adding structural differentiation 1960	.40	
Percentage GDP due to manufacturing 1950 with primary enrollment ratio 1960		.12
adding structural differentiation 1950	.46	
adding structural differentiation 1960	.50	
Percentage GDP due to manufacturing 1950 with secondary enrollment ratio 1960		.18
adding structural differentiation 1950	.63	
adding structural differentiation 1960	.57	
Percentage GDP due to manufacturing 1950 with higher enrollment ratio 1960		.32
adding structural differentiation 1950	.52	
adding structural differentiation 1960	.34	
Percentage population urban 1950 with primary enrollment ratio 1960		.49
adding structural differentiation 1950	.51	
adding structural differentiation 1960	.50	
Percentage population urban 1950 with secondary enrollment ratio 1960		.55
adding structural differentiation 1950	.62	
adding structural differentiation 1960	.55	
Percentage population urban 1950 with higher enrollment ratio 1960		.52
adding structural differentiation 1950	.57	
adding structural differentiation 1960	.52	

	Associations	
C2	Multiple	Simple
Number of radio receivers per 1,000 population 1950 with primary enrollment ratio 1960		.60
adding structural differentiation 1950	.61	
adding structural differentiation 1960	.61	
Number of radio receivers 1950 with secondary enrollment ratio 1960		.58
adding structural differentiation 1950	.62	
adding structural differentiation 1960	.58	
Number of radio receivers per 1,000 population 1950 with higher enrollment ratio 1960		.64
adding structural differentiation 1950	.66	
adding structural differentiation 1960	.73	
D1		
Economic flexibility 1950 with structural differentiation 1960		.69
adding primary enrollment ratio 1960	.70	
adding secondary enrollment ratio 1960	.71	
adding higher enrollment ratio 1960	.69	
Industrial diversity 1950 with structural differentiation 1960		.77
adding primary enrollment ratio 1960	.79	
adding secondary enrollment ratio 1960	.78	
adding higher enrollment ratio 1960	.77	
D2		
Economic flexibility 1950 with structural differentiation 1960		.69
adding GNP per capita 1950	.70	
adding GNP per capita 1960	.72	
adding percentage of GDP due to manufacturing 1950	.83	
adding percentage of GDP due to manufacturing 1960	.77	
adding number of radio receivers per 1,000 population 1950	.71	
adding number of radio receivers per 1,000 population 1960	.73	

	Associations	
	Multiple	Simple
D2		
Industrial diversity 1950 with structural differentiation 1960		.77
adding GNP per capita 1950	.77	
adding GNP per capita 1960	.78	
adding percentage population urban 1950	.82	
adding percentage population urban 1960[a]	.79	
E1		
Economic flexibility 1950 with primary enrollment ratio 1960		.41
adding GNP per capita 1950	.46	
adding GNP per capita 1960	.59	
adding percentage GDP due to manufacturing 1950	.57	
adding percentage GDP due to manufacturing 1960	.56	
adding number of radio receivers per 1,000 population 1950	.61	
adding number of radio receivers per 1,000 population 1960	.54	
Economic flexibility 1950 with secondary enrollment ratio 1960		.44
adding GNP per capita 1950	.62	
adding GNP per capita 1960	.59	
adding percentage GDP due to manufacturing 1950	.54	
adding percentage GDP due to manufacturing 1960	.56	
adding number of radio receivers per 1,000 population 1950	.61	
adding number of radio receivers per 1,000 population 1960	.60	
Economic flexibility 1950 with higher enrollment ratio 1960		.57
adding GNP per capita 1950	.70	
adding GNP per capita 1960	.59	
adding percentage GDP due to manufacturing 1950	.62	
adding percentage GDP due to manufacturing 1960	.64	
adding number of radio receivers per 1,000 population 1950	.66	
adding number of radio receivers per 1,000 population 1960	.63	

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[a] Communities of 100,000 or more.

	Associations	
	Multiple	Simple
E1		
Industrial diversity 1950 with primary enrollment ratio 1960		.27
adding GNP per capita 1950	.35	
adding GNP per capita 1960	.48	
adding percentage of population urban 1950	.49	
adding percentage of population urban 1960	.63	
Industrial diversity 1950 with secondary enrollment ratio 1960		.39
adding GNP per capita 1950	.58	
adding GNP per capita 1960	.52	
adding percentage population urban 1950	.57	
adding percentage population urban 1960	.59	
Industrial diversity 1950 with higher enrollment ratio 1960		.38
adding GNP per capita 1950	.45	
adding GNP per capita 1960	.39	
adding percentage population urban 1950	.52	
adding percentage population urban 1960	.66	
E2		
Economic flexibility 1950 with primary enrollment ratio 1960		.41
adding structural differentiation 1950	.42	
adding structural differentiation 1960	.44	
Economic flexibility 1950 with secondary enrollment ratio 1960		.44
adding structural differentiation 1950	.53	
adding structural differentiation 1960	.54	
Economic flexibility 1950 with higher enrollment ratio 1960		.57
adding structural differentiation 1950	.58	
adding structural differentiation 1960	.59	
Industrial diversity 1950 with primary enrollment ratio 1960		.27
adding structural differentiation 1950	.40	
adding structural differentiation 1960	.35	

	Associations	
E2	Multiple	Simple
Industrial diversity 1950 with secondary enrollment ratio 1960		.39
adding structural differentiation 1950	.52	
adding structural differentiation 1960	.45	
Industrial diversity 1950 with higher enrollment ratio 1960		.38
adding structural differentiation 1950	.52	
adding structural differentiation 1960	.38	
F1		
Economic flexibility 1950 with GNP per capita 1960		.08
adding structural differentiation 1950	.15	
adding structural differentiation 1960	.28	
Economic flexibility 1950 with percentage GDP due to manufacturing 1960		.71
adding structural differentiation 1950	.75	
adding structural differentiation 1960	.78	
Economic flexibility 1950 with number of radio receivers per 1,000 population 1960		.28
adding structural differentiation 1950	.43	
adding structural differentiation 1960	.44	
Industrial diversity 1950 with GNP per capita 1960		.18
adding structural differentiation 1950	.18	
adding structural differentiation 1960	.46	
Industrial diversity 1950 with percentage of population urban 1960		.34
adding structural differentiation 1950	.44	
adding structural differentiation 1960	.43	
F2		
Economic flexibility 1950 with GNP per capita 1960		.08
adding primary enrollment ratio 1960	.45	
adding secondary enrollment ratio 1960	.44	
adding higher enrollment ratio 1960	.17	

	Associations	
F2	Multiple	Simple
Economic flexibility 1950 with percentage GDP due to manufacturing 1960		.71
adding primary enrollment ratio 1960	.76	
adding secondary enrollment ratio 1960	.76	
adding higher enrollment ratio 1960	.77	
Economic flexibility 1950 with number of radio receivers per 1,000 population 1960		.28
adding primary enrollment ratio 1960	.47	
adding secondary enrollment ratio 1960	.52	
adding higher enrollment ratio 1960	.43	
Industrial diversity 1950 with GNP per capita 1960		.18
adding primary enrollment ratio 1960	.44	
adding secondary enrollment ratio 1960	.42	
adding higher enrollment ratio 1960	.25	
Industrial diversity 1950 with percentage of population urban 1960		.34
adding primary enrollment ratio 1960	.65	
adding secondary enrollment ratio 1960	.57	
adding higher enrollment ratio 1960	.64	
G1		
Structural differentiation 1950 with primary enrollment ratio 1960		.39
adding GNP per capita 1950	.44	
adding GNP per capita 1960	.55	
adding percentage GDP due to manufacturing 1950	.46	
adding percentage GDP due to manufacturing 1960	.54	
adding percentage population urban 1950	.51	
adding percentage population urban 1960	.64	
adding number of radio receivers per 1,000 population 1950	.61	
adding number of radio receivers per 1,000 population 1960	.51	

	Associations	
G1	Multiple	Simple
Structural differentiation 1950 with secondary enrollment ratio 1960		.53
adding GNP per capita 1950	.73	
adding GNP per capita 1960	.64	
adding percentage GDP due to manufacturing 1950	.63	
adding percentage GDP due to manufacturing 1960	.71	
adding percentage population urban 1950	.62	
adding percentage population urban 1960	.64	
adding number of radio receivers per 1,000 population 1950	.62	
adding number of radio receivers per 1,000 population 1960	.62	
Structural differentiation 1950 with higher enrollment ratio 1960		.51
adding GNP per capita 1950	.53	
adding GNP per capita 1960	.52	
adding percentage GDP due to manufacturing 1950	.52	
adding percentage GDP due to manufacturing 1960	.57	
adding percentage population urban 1950	.57	
adding percentage population urban 1960	.68	
adding number of radio receivers per 1,000 population 1950	.66	
adding number of radio receivers per 1,000 population 1960	.56	
G2		
Structural differentiation 1950 with primary enrollment ratio 1960		.39
adding economic flexibility 1950	.42	
adding economic flexibility 1960	.39	
adding industrial diversity 1950	.39	
adding industrial diversity 1960	.40	
Structural differentiation 1950 with secondary enrollment ratio 1960		.53
adding economic flexibility 1950	.53	
adding economic flexibility 1960	.53	
adding industrial diversity 1950	.53	
adding industrial diversity 1960	.53	

	Associations	
	Multiple	Simple
G2		
Structural differentiation 1950 with higher enrollment ratio 1960		.51
adding economic flexibility 1950	.58	
adding economic flexibility 1960	.51	
adding industrial diversity 1950	.52	
adding industrial diversity 1960	.52	
H1		
Structural differentiation 1950 with GNP per capita 1960		.14
adding primary enrollment ratio 1960	.44	
adding secondary enrollment ratio 1960	.41	
adding higher enrollment ratio 1960	.18	
Structural differentiation 1950 with percentage of GDP due to manufacturing 1960		.72
adding primary enrollment ratio 1960	.88	
adding secondary enrollment ratio 1960	.81	
adding higher enrollment ratio 1960	.75	
Structural differentiation 1950 with percentage of population urban 1960		.44
adding primary enrollment ratio 1960	.67	
adding secondary enrollment ratio 1960	.57	
adding higher enrollment ratio 1960	.65	
Structural differentiation 1950 with number of radio receivers per 1,000 population 1960		.42
adding primary enrollment ratio 1960	.53	
adding secondary enrollment ratio 1960	.54	
adding higher enrollment ratio 1960	.49	
H2		
Structural differentiation 1950 with GNP per capita 1960		.14
adding economic flexibility 1950	.15	
adding economic flexibility 1960	.18	
adding industrial diversity 1950	.18	
adding industrial diversity 1960	.30	

	Associations	
	Multiple	Simple
H2		
Structural differentiation 1950 with percentage GDP due to manufacturing 1960		.72
adding economic flexibility 1950	.76	
adding economic flexibility 1960	.87	
Structural differentiation 1950 with percentage of population urban 1960		.44
adding industrial diversity 1950	.44	
adding industrial diversity 1960	.44	
Structural differentiation 1950 with number of radio receivers per 1,000 population 1960		.42
adding economic flexibility 1950	.43	
adding economic flexibility 1960	.43	
I1		
Structural differentiation 1950 with economic flexibility 1960		.51
adding primary enrollment ratio 1960	.51	
adding secondary enrollment ratio 1960	.51	
adding higher enrollment ratio 1960	.51	
Structural differentiation 1950 with industrial diversity 1960		.85
adding primary enrollment ratio 1960	.85	
adding secondary enrollment ratio 1960	.85	
adding higher enrollment ratio 1960	.85	
I2		
Structural differentiation 1950 with economic flexibility 1960		.51
adding GNP per capita 1950	.54	
adding GNP per capita 1960	.55	
adding percentage GDP due to manufacturing 1950	.73	
adding percentage GDP due to manufacturing 1960	.79	
adding number of radio receivers per 1,000 population 1950	.53	
adding number of radio receivers per 1,000 population 1960	.52	

	Associations	
	Multiple	Simple
I2		
Structural differentiation 1950 with industrial diversity 1960		.85
adding GNP per capita 1950	.85	
adding GNP per capita 1960	.86	
adding percentage population urban 1950	.87	
adding percentage population urban 1960	.85	
J1		
Primary enrollment ratio 1950 with GNP per capita 1960		.40
adding economic flexibility 1950	.41	
adding economic flexibility 1960	.44	
adding industrial diversity 1950	.41	
adding industrial diversity 1960	.43	
Higher enrollment ratio 1950 with GNP per capita 1960		.45
adding economic flexibility 1950	.48	
adding economic flexibility 1960	.46	
adding industrial diversity 1950	.45	
adding industrial diversity 1960	.47	
Primary enrollment ratio 1950 with percentage GDP due to manufacturing 1960		.11
adding economic flexibility 1950	.73	
adding economic flexibility 1960	.74	
Higher enrollment ratio 1950 with percentage GDP due to manufacturing 1960		.18
adding economic flexibility 1950	.80	
adding economic flexibility 1960	.81	
Primary enrollment ratio 1950 with percentage of population urban 1960		.59
adding industrial diversity 1950	.63	
adding industrial diversity 1960	.64	
Higher enrollment ratio 1950 with percentage of population urban 1960		.60
adding industrial diversity 1950	.60	
adding industrial diversity 1960	.65	

	Associations	
	Multiple	Simple
J1		
Primary enrollment ratio 1950 with number of radios per 1,000 population 1960		.37
adding economic flexibility 1950	.40	
adding economic flexibility 1960	.43	
Higher enrollment ratio 1950 with number of radios per 1,000 population 1960		.32
adding economic flexibility 1950	.35	
adding economic flexibility 1960	.37	
J2		
Primary enrollment ratio 1950 with GNP per capita 1960		.40
adding structural differentiation 1950	.40	
adding structural differentiation 1960	.43	
Higher enrollment ratio 1950 with GNP per capita 1960		.45
adding structural differentiation 1950	.45	
adding structural differentiation 1960	.41	
Primary enrollment ratio 1950 with percentage GDP due to manufacturing 1960		.11
adding structural differentiation 1950	.74	
adding structural differentiation 1960	.75	
Higher enrollment ratio 1950 with percentage GDP due to manufacturing 1960		.18
adding structural differentiation 1950	.75	
adding structural differentiation 1960	.74	
Primary enrollment ratio 1950 with percentage of population urban 1960		.59
adding structural differentiation 1950	.64	
adding structural differentiation 1960	.66	
Higher enrollment ratio 1950 with percentage of population urban 1960		.60
adding structural differentiation 1950	.63	
adding structural differentiation 1960	.65	
Primary enrollment ratio 1950 with number of radio receivers per 1,000 population 1960		.37
adding structural differentiation 1950	.48	
adding structural differentiation 1960	.50	

	Associations	
	Multiple	Simple
J2		
Higher enrollment ratio 1950 with number of radio receivers per 1,000 population 1960		.32
adding structural differentiation 1950	.44	
adding structural differentiation 1960	.47	
K1		
Primary enrollment ratio 1950 with economic flexibility 1960		.26
adding GNP per capita 1950	.41	
adding GNP per capita 1960	.32	
adding percentage GDP due to manufacturing 1950	.73	
adding percentage GDP due to manufacturing 1960	.81	
adding number of radio receivers per 1,000 population 1950	.40	
adding number of radio receivers per 1,000 population 1960	.35	
Higher enrollment ratio 1950 with economic flexibility 1960		.43
adding GNP per capita 1950	.50	
adding GNP per capita 1960	.43	
adding percentage GDP due to manufacturing 1950	.76	
adding percentage GDP due to manufacturing 1960	.84	
adding number of radio receivers per 1,000 population 1950	.48	
adding number of radio receivers per 1,000 population 1960	.47	
Primary enrollment ratio 1950 with industrial diversity 1960		.29
adding GNP per capita 1950	.42	
adding GNP per capita 1960	.33	
adding percentage population urban 1950	.63	
adding percentage population urban 1960	.42	
Higher enrollment ratio 1950 with industrial diversity 1960		.29
adding GNP per capita 1950	.42	
adding GNP per capita 1960	.32	
adding percentage population urban 1950	.63	
adding percentage population urban 1960	.42	

	Associations	
K2	Multiple	Simple
Primary enrollment ratio 1950 with economic flexibility 1960		.26
adding structural differentiation 1950	.85	
adding structural differentiation 1960	.65	
Higher enrollment ratio 1950 with economic flexibility 1960		.43
adding structural differentiation 1950	.85	
adding structural differentiation 1960	.68	
Primary enrollment ratio 1950 with industrial diversity 1960		.29
adding structural differentiation 1950	.85	
adding structural differentiation 1960	.82	
Higher enrollment ratio 1950 with industrial diversity 1960		.29
adding structural differentiation 1950	.85	
adding structural differentiation 1960	.82	
L1		
Primary enrollment ratio 1950 with structural differentiation 1960		.26
adding GNP per capita 1950	.37	
adding GNP per capita 1960	.31	
adding percentage GDP due to manufacturing 1950	.83	
adding percentage GDP due to manufacturing 1960	.68	
adding percentage population urban 1950	.71	
adding percentage population urban 1960	.43	
adding number of radio receivers per 1,000 population 1950	.49	
adding number of radio receivers per 1,000 population 1960	.44	
Higher enrollment ratio 1950 with structural differentiation 1960		.32
adding GNP per capita 1950	.40	
adding GNP per capita 1960	.34	
adding percentage GDP due to manufacturing 1950	.83	
adding percentage GDP due to manufacturing 1960	.76	
adding percentage population urban 1950	.70	
adding percentage population urban 1960	.44	
adding number of radio receivers per 1,000 population 1950	.49	
adding number of radio receivers per 1,000 population 1960	.47	

	Associations	
L2	Multiple	Simple
Primary enrollment ratio 1950 with structural differentiation 1960		.26
adding economic flexibility 1950	.79	
adding economic flexibility 1960	.69	
adding industrial diversity 1950	.77	
adding industrial diversity 1960	.82	
Higher enrollment ratio 1950 with structural differentiation 1960		.32
adding economic flexibility 1950	.79	
adding economic flexibility 1960	.64	
adding industrial diversity 1950	.77	
adding industrial diversity 1960	.82	

APPENDIX E

EDUCATIONAL STRUCTURAL DIFFERENTIATION IN 1968: A PRELIMINARY EXPLORATION

The purpose of these few pages is to bring the analysis presented in Chapter IV, to the extent possible, up to date. It is extremely difficult to acquire good information on recent developments in the educational systems of Latin America. Reports are scattered and spotty, and it has proven impossible to ascertain the accuracy of such reports as are available by cross-checking against enrollment and budget data, except in a very few cases. The data presented here consequently must be viewed with caution. They are of questionable validity. Thus, they are more appropriately included in an appendix, rather than in the body of the report.

It has been possible to use this data to develop a Guttman scale of the educational structural differentiation of the Latin American nations for approximately 1968. It is presented in Tables E-1 and E-2. The ranking of the nations in 1968 is quite similar to that in 1960 (rank association = .76). Most nations have maintained roughly the same position, some dropping slightly in rank (e.g., Panama), others rising slightly (e.g., Honduras). Peru, Venezuela and Colombia have joined the rank of the most differentiated.

Looking at the scale items, some marked changes have occurred since 1960. Almost every one of the items has been established in some additional system(s) during the past eight years. The most dramatic change has occurred in the popularity of national educational planning agencies. In 1960 such agencies were found in only forty-two percent of the Latin American systems. By 1968 only Haiti and Uruguay had not established planning agencies. This undoubtedly reflects the great emphasis placed on planning throughout the developing world, stimulated particularly by such international organizations as Unesco, the OAS and the World Bank. Given the wide differences on most educational variables which continue to obtain among the nations with educational planning agencies, it must certainly be the case that some of the planning organizations represent little more than barely operative obeisances toward the international agencies and aid-giving nations and organizations which have been actively promoting planning.

Two other items which have evidenced a dramatic increase in popularity are national apprenticeship commission and university faculties of Biology, Chemistry and Physics. The establishment of national apprenticeship commissions may reflect the same forces which have led to the establishment of educational planning agencies, in that most work on educational planning has been phrased in terms of meeting manpower needs for economic development. The same may be true of the suddenly proliferating university science faculties.

In order to get a clearer picture of recent changes, Table E-3 presents the 1960 Latin American scale of educational structural differentiation with changes by 1968 superimposed. The underlined X's adjacent to 1960 absence codings indicate items acquired during the past eight years. There are a total of fifty-three such changes. Of these fifty-three new present codings, twenty-five either pick up what were skipped item scale errors in 1960 or are connected to the 1960 scale pattern with no intervening absence codings. Ten are connected to the 1960 pattern with one intervening absence coding, and eighteen are not at all associated with the 1960 pattern, being separated from it by two or more absence codings.

It was predicted, before systematically comparing the 1960 and 1968 scales, that by the present time, the Latin American educational systems would have acquired those items which were skipped item errors in 1960, and those items immediately adjacent to the 1960 scale pattern. Of sixteen skipped item errors in 1960, five have been acquired. Of the sixteen possible predictions concerning adjacent-item acquisition, six are successful. Thus, the predictions from the 1960 scale have been successful in eleven of thirty-two cases, representing thirty-four percent accuracy.[1] This is considerably below the level of accuracy achieved in predicting from 1950 to 1960.

It may be that this difference in ability to predict accurately over the two time periods is a statistical artifact. The highly accurate predictions from 1950 to

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[1] It is perhaps more appropriate to exclude Haiti and Ecuador from these calculations, since they have acquired no new scale items since 1960. This would raise the level of accuracy of prediction to thirty-nine percent (eleven successes out of twenty-eight possible) which is still substantially below the level of accuracy obtained when predicting from 1950 to 1960.

1960 may reflect the particular items for which 1950 data were found. That is, it may be that those items not included on the 1950 scale, for lack of data, are precisely those which, had they been included, would have substantially lowered the accuracy of predictions. On the other hand, it is possible that the errors in coding which it is thought are rather prevalent in the 1968 data operate so as to lower the accuracy of predictions from 1960 to the present.

If, however, the difference in predictive accuracy reflects the empirical situation, the hypotheses phrased in Chapter IV are called into question. One substantive explanation that can be advanced refers again to the sudden popularity of educational planning activity in Latin America, starting just before 1960. It is possible that the pattern of educational system development from 1950 to 1960 represents a "natural" semi-evolutionary growth sequence which obtained up to 1960, while the post-1960 changes represent the beginning of a new pattern produced in response to international pressures for educational planning and the accompanying emphasis on manpower development. These pressures can be considered as one type of changing social condition, as discussed in Chapter IV (pp. 122-123), which can affect the incidence of scale items, and thus render predictions from scale pattern inaccurate. If this is so, one could expect this new, post-1960, pattern to continue to obtain over the next few years. Consequently, predictions as to item acquisition made from the 1968 scale may be considerably more successful than those made from the 1960 scale.

Whatever the case, until the validity of the data presented in this appendix can be assessed more fully, and the stability of the new pattern of educational system development in Latin America (if it does in fact exist) can be determined, it would be perhaps wise to suspend judgement concerning the evolutionary hypothesis advanced in Chapter IV.

TABLE E-1

SCALOGRAM OF EDUCATIONAL STRUCTURAL DIFFERENTIATION: LATIN AMERICA 1968

	Ministry, etc.	Special pedagog. training sec. tchrs.	Secondary agricultural school	National educ. planning agency	Research inst. social science	Ministerial advisory body	National apprenticeship commission	Ministerial Research division	Univ. facs. bio., chem., phys.	Univ. level. tchr. trng. inst.	Research inst. phys-bio. science	Ministerial A-V division	Military school	Research inst. economics	Research inst. agriculture	Specialized military school	Univ. level school librarianship	Specialized industrial school	Univ. fac. soc. or anth.	Graduate faculty	Research inst. education
Haiti	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Honduras	X	X	X	X	X	0	0	0	0	X	0	0	0	X	0	0	0	0	0	0	X
Guatemala	X	X	X	X	X	X	0	0	0	0	0	0	X	0	0	0	X	0	0	X	X
Nicaragua	X	0	X	X	X	X	X	0	0	0	0	0	X	0	0	X	0	0	0	0	0
Panama	X	X	X	X	X	X	X	X	X	0	0	0	0	0	0	0	X	0	0	0	0
Paraguay	X	X	X	X	0	X	X	X	X	X	0	0	0	0	X	0	0	0	0	0	0
Costa Rica	X	X	X	X	X	X	X	0	X	X	0	0	0	0	X	0	0	0	0	X	X
Dominican Rep.	X	X	X	X	X	X	0	X	X	X	X	X	0	0	0	0	0	0	X	0	0
El Salvador	X	X	X	X	X	X	0	X	X	X	X	X	X	X	0	0	0	0	0	0	0
Bolivia	X	X	X	X	X	0	X	X	0	X	X	X	X	X	X	0	0	0	0	0	0
Ecuador	X	X	X	X	X	X	0	X	X	0	X	0	X	X	X	X	X	0	0	0	0
Uruguay	X	X	X	0	X	0	X	X	0	X	X	X	X	X	X	X	X	X	0	0	0
Mexico	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0
Peru	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	X	X	X
Venezuela	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	X
Argentina	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Brazil	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chile	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Colombia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

C.R. = .92

C.S. = .68

C.R. using only items with -80% in modal category .92

TABLE E-2

SCALE OF EDUCATIONAL STRUCTURAL DIFFERENTIATION LATIN AMERICA 1968

Step No.	Item	Proportion Having Item	Error
1.*	Ministry	1.00	--
	University		
	Teacher training institution		
	Inspectorate		
	Curriculum agency		
	Pre-primary school		
	Primary school		
	Secondary school		
	Secondary vocational education		
	Secondary vocational school		
	Secondary commercial school		
	Secondary industrial or crafts-trades school		
	Special education class		
	Special education school		
2.	Special pedagogical training for secondary teachers	.95	1
3.	Secondary agricultural school	.95	0
	National educational planning agency	.90	1
	University research institute in the social sciences	.90	1
4.	Ministerial advisory body	.78	2
5.	National apprenticeship commission	.68	3
6.	Ministerial research division	.73	1
	University faculties of Biology Chemistry and Physics	.68	2
7.	University level teacher training institution	.73	2
8.	University research institute in physical-biological sciences	.63	0
	Ministerial audio-visual division	.57	1
9.	Military school	.68	2
	University research institute in economics	.63	1

TABLE E-2--Continued

Step No.	Item	Proportion Having Item	Error
10.	University research institute in agriculture	.63	2
11.	Specialized military school	.52	1
	University level school of librarianship	.57	2
12.	Specialized secondary industrial school	.36	1
13.	University faculty of Sociology or Anthropology	.42	1
	University faculty of graduate studies	.42	3
14.	University research institute in education	.47	3

[*] The items in Step No. 1 are not properly part of the scale, being present in all nineteen nations. They are included to give a complete picture but are not used in computing coefficients of reproducibility or scalability.

TABLE E-3

SCALOGRAM OF EDUCATIONAL STRUCTURAL DIFFERENTIATION LATIN AMERICA 1960 WITH CHANGES BY 1968 ADDED

	Ministry, etc.	Pedagog. trng. sec. teachers	Special education class	Special education school	Ministerial advisory body	Secondary agricultural school	Univ. level tchr. trng. inst.	Military school	Research inst. phys-bio. sci.	Research inst. social science	Univ. level sch. librarianship	National educ. planning agency	National apprenticeship comm.	Ministerial research division	Research inst. agriculture	Research inst. economics	Specialized military school	Univ. fac. bio, chem., phys.	Ministerial A-V division	Univ. facs. soc. or anth.	Graduate faculty	Specialized industrial school	Research inst. education
Haiti	X	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guatemala	X	X	X	X	X	X	0	X	0	X	X	0X	0	0	0	0	0	0	0	0	0X	0	0X
Nicaragua	X	0	X	X	X	X	0	X	0	0	0	0X	0X	0	0	0	X	0	0	0	0	0	0
Costa Rica	X	X	X	X	X	X	X	0	0	0X	0	0X	X	0	X	0	0	0X	0	0	X	0	0X
Honduras	X	X	X	X	0	X	X	0	0	0X	0	0X	0	0	0	0X	0	0	0	0	0	0	0X
Paraguay	X	X	X	X	X	X	X	0	0	0	0	X	0X	X	X	0	0	0X	0	0	0	0	0
El Salvador	X	X	X	X	X	X	X	X	X	0X	0	0X	0	0X	0	0X	0	0X	X	0	0	0	0
Bolivia	X	X	X	X	0	X	X	X	X	X	0	0X	0X	0X	X	X	0	0	X	0	0	0	0
Dominican Rep.	X	X	X	X	X	X	X	0	X	X	0	0X	0	0X	0	0	0	0X	0X	0X	0	0	0
Peru	X	X	X	X	X	X	X	X	X	X	X	0X	0X	X	X	0X	X	0X	X	0X	0X	0	0X
Panama	X	X	X	X	X	X	0	0	0	X	X	X	0X	0X	0	0	0	0X	0	0	0	0	0

TABLE E-3--Continued

	Ministry, etc.	Pedagog. trng. sec. teachers	Special education class	Special education school	Ministerial advisory body	Secondary agricultural sch.	Univ.level tchr.trng. inst.	Military school	Research inst.phys-bio. sci.	Research inst.social sci.	Univ.level sch.librarianship	National educ.planning ag.	Nat. apprenticeship comm.	Ministerial resrch.div.	Research inst. agriculture	Research inst. economics	Specialized military school	Univ.fac.bio.,chem., phys.	Ministerial A-V division	Univ.facs.soc. or anth.	Graduate faculty	Specialized industrial sch.	Research inst. education
Colombia	X	X	X	X	X	X	X	0X	X	X	X	X	X	X	0X	0X	0X	X	X	X	0X	0X	0X
Uruguay	X	X	X	X	0	X	X	X	X	X	X	0	X	X	X	X	0X	0	X	0	0	0	0
Venezuela	X	X	0X	0X	X	X	X	X	X	X	X	X	X	X	X	X	X	0X	0X	0X	0	X	X
Ecuador	X	X	X	X	X	X	0	X	X	X	X	X	0	X	X	X	X	X	0	0	0	0	0
Mexico	X	X	X	X	X	X	X	X	X	X	X	X	0X	X	X	X	X	X	X	X	X	X	0
Argentina	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Brazil	X	X	X	X	X	X	X	X	X	X	X	0X	X	X	X	X	X	X	X	X	X	X	X
Chile	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Sources of Data Used in Appendix E

Some of the data used in constructing the scale presented in this appendix are found in Appendix B. This list includes only those sources used exclusively for obtaining data relative to educational developments in the post-1960 period.

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